DOES VIRTUALITY MATTER? A MODERATED MODEL FOR PROJECT RISKS AND PERFORMANCE BY DEGREE OF VIRTUAL COMMUNICATION

by

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ABSTRACT

ELMOHANAD ELSAYAD. Does Virtuality Matter? A Moderated Model of Project Risks and Performance by Degree of Virtual Communication (Under the direction of DR. FRANZ KELLERMANNS)

As remote work gains popularity due to the rise of virtual communication tools post the COVID 19 pandemic, understanding its impact on project management is crucial. This dissertation investigates the moderating effect of virtual communication on the relationship between project risks and performance. The study presents robust evidence that virtuality significantly and negatively moderates the influence of organizational, requirements and user risks on performance. These findings offer valuable insights into the complexities of virtual project environments, underscoring the need for strategic virtual engagement in managing project risks to avoid performance detriments. The research enhances project management literature by highlighting the critical need for adept project managers to navigate the complexities of virtual and risk-prone environments effectively.

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DEDICATION

This dissertation is lovingly dedicated to my parents, Randa Elshamy and Aly Elsayad, whose profound investment in my life has been the driving force behind every one of my achievements. Their unwavering support, boundless love, and the trust they instill in me empower me to aspire to conquer the greatest heights. In the same breath, I extend this dedication to my siblings, Shimo, Rabab, and Mo, whose belief in me and unconditional love provide a constant source of comfort and motivation. I am also deeply grateful to my friend Khaled Abdellatif, a beacon of belief and companionship, who has been by my side through thick and thin, challenging me to think critically and elevate my reasoning.

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CHAPTER 1: RESEARCH OVERVIEW

1.1 Background of the Study

In recent years, the global business landscape has witnessed a significant shift towards virtual teams and virtual collaboration, driven by advancements in technology and the recent Covid-19 pandemic (Venkatesh, 2020). Virtual teams, comprised of geographically dispersed members who collaborate and communicate primarily through digital platforms, have become increasingly prevalent in organizations across various industries (Herath & Herath, 2020). While virtual teams have been in existence for over two decades, the pandemic accelerated their adoption as organizations worldwide embraced remote work arrangements to ensure business continuity (Venkatesh, 2020).

Before the pandemic, virtual teams were often formed by choice, with the intention of leveraging the diverse expertise and talents of individuals located in different geographic locations (Herath & Herath, 2020). These teams offered organizations the opportunity to tap into a global talent pool, enhance knowledge sharing, and facilitate collaboration across borders. However, the widespread implementation of social distancing measures and travel restrictions necessitated a shift towards remote work and virtual collaboration (Herath & Herath, 2020). As a result, organizations had to rely more heavily on virtual communication and collaboration tools to facilitate team interactions, project coordination, and knowledge sharing (Gibson et al., 2014).

The rise of virtual teams during the pandemic has fundamentally transformed the way organizations operate. What was once considered an optional approach to team formation has become essential for the survival and success of many businesses (Richter, 2020). The ability to adapt quickly to remote work and virtual collaboration has become a competitive advantage for organizations, allowing them to maintain productivity, sustain relationships with clients and

stakeholders, and continue project operations despite the challenges imposed by the pandemic (Venkatesh, 2020).

Virtual teams have proven to be instrumental in maintaining organizational structure and performance in the face of unprecedented disruptions (Shuffler et al., 2010). By leveraging virtual communication technologies, teams can transcend the limitations of physical distance and time zones, enabling seamless collaboration and knowledge sharing (Powell et al., 2004). Moreover, virtual teams offer increased flexibility, allowing team members to work in their preferred locations and adapt to individual schedules. This flexibility can enhance work-life balance, job satisfaction, and ultimately contribute to higher performance levels (Richter, 2020).

However, the rapid adoption of virtual collaboration and communication methods also presents unique challenges that need to be addressed (Griffith et al., 2003). While virtual collaboration offers advantages such as increased flexibility, access to a global talent pool, and cost savings, it also presents several hurdles. Communication barriers, reduced non-verbal cues, time zone differences, cultural diversity, and technology-related issues can hinder effective collaboration and coordination in virtual teams (Venkatesh, 2020). Consequently, organizations need to understand the dynamics of virtual teams and the impact of virtual communication on project outcomes to harness the full potential of these teams while mitigating potential risks (Gilson et al., 2015).

Project risk management, on the other hand, is a critical discipline aimed at identifying, assessing, and mitigating risks that can affect project outcomes (Wallace & Keil, 2004). Traditionally, project risk management practices have primarily focused on physical projects, where team members are co-located and have immediate access to information and resources

(Liu &Wang, 2014). However, the transition to virtual teams introduces new dynamics and complexities that necessitate reevaluating risk management approaches in virtual environments.

In the realm of project teams, achieving success in project tasks is not solely reliant on individual efforts, but also hinges on effective communication within the team and the cultivation of strong working relationships (Huemann, 2010). However, the advent of virtual collaboration tools, driven by the evolving work culture, has brought about notable transformations in the way project teams communicate (Ocker, 2001). This shift in communication style has brought to the forefront the unique challenges faced by project teams that operate in a virtual environment.

Virtual teams, diverging from traditional face-to-face interactions, are markedly dependent on digital platforms and technological tools to enable communication and collaboration (Ocker, 2001). This dependency prompts an escalation in communication frequency, as teams navigate through physical and geographical barriers, perpetually connecting via various channels such as video conferences, chat platforms, email threads, and project management software (Gilson et al., 2015). This incessant, rapid information flow has come to characterize virtual teams. However, this prevalent use of digital communication channels introduces a unique set of challenges (Culnan et al., 2010). The proliferation of communication tools can potentially result in information fragmentation and a palpable sense of overload (O'Leary et al., 2007). Given the multitude of available communication channels, team members might grapple with managing and prioritizing the voluminous information exchanged, thereby raising legitimate concerns regarding crucial messages being lost or overlooked amidst a deluge of notifications and updates the absence of non-verbal cues, such as body language, facial expressions, and tone of voice, presents a substantial challenge in virtual communication,

potentially leading to misinterpretations and miscommunications within the team (Manyard et al., 2012). Such crucial elements, often pivotal in face-to-face interactions, may be lost or misconstrued in virtual environments, thereby hindering effective understanding. To enable virtual teams to navigate through these communication challenges and prosper, it becomes imperative to recognize and aptly address these issues (Pullan, 2016). Project managers and team members need to formulate strategies and guidelines aimed at fostering effective virtual communication (Xin, 2015). This involves establishing lucid communication protocols, setting clear expectations for response times, and identifying suitable channels for varied communication types (Alnuaimi et al., 2010). Additionally, cultivating a culture that champions open and transparent communication, alongside promoting regular check-ins and facilitating virtual team-building activities, can serve to fortify working relationships and buffer the effects of physical dispersion.

While considerable research has been conducted on project risk management and the effects of virtual communication on project success independently (Brake, 2006; Pauleen, 2003; Berry, 2011) there is a lack of understanding regarding the interplay between these two constructs. Specifically, the moderating effect of virtual communication on the relationship between project risk and project performance remains relatively unexplored in the literature. In Wallace and Keil's work in 2004, they identify various dimensions of risks in IT projects that can potentially influence project outcomes. These dimensions encompass user risk, requirement risk, project complexity risk, technological newness risk, planning and control risk, team risk, organizational environment risk, and process risk. Each of these dimensions reveals particular facets of projects that can pose challenges, from user involvement and clarity of requirements to the organizational environment and project management practices.

In the context of the present study, the focus will be selectively placed on user risk, organizational risk, requirement risk, and team risk due to their pronounced impact and pertinence in the sphere of virtual team projects, particularly considering the aspects of user involvement, organizational support, clarity of requirements, and team coherence which are crucial for the successful execution and management of virtual team projects amidst the digital and remote working era (Boehm, 1991).

Therefore, this dissertation aims to bridge this gap in knowledge by investigating the moderating effect of virtual communication on the relationship between project risk and project performance in virtual teams. By exploring this interaction, the research will contribute to a deeper understanding of how virtual communication practices influence project outcomes. It will also provide valuable insights for project managers seeking to optimize project success in virtual team environments by developing effective risk management strategies and leveraging virtual communication.

1.2 Theoretical Foundation

This dissertation will draw upon several theoretical frameworks to provide a comprehensive understanding of the research topic. These theories include Social Information Processing Theory, Media Richness Theory, Adaptive Structuration Theory, and Social Presence Theory. Each theory offers unique perspectives on how communication and technology influence virtual teams and their performance (Schiller et al., 2007).

Social Information Processing Theory (SIPT) focuses on how individuals form impressions and develop relationships in computer-mediated communication (Walther, 1992). In the context of virtual teams, SIPT can help explain how team members interpret and understand project risk information in the absence of face-to-face interaction (Beranek, 1999). SIPT suggests

that individuals can build social connections through extended online interactions, compensating for the lack of non-verbal cues. This theory highlights the importance of effective communication and relationship-building strategies in virtual teams to enhance project success. (Walther & Beranek, 1999; Walther, 1995).

Adaptive Structuration Theory (AST) explores how individuals shape and are shaped by the structures and technologies of their social systems (Poole & DeSanctis, 1994). In the virtual team context, AST highlights the reciprocal relationship between technology and social structures. AST suggests that virtual teams develop their own norms, rules, and communication patterns to adapt to the virtual environment (Dennis & Garfield, 2003). Understanding the interplay between the social structures and technology in virtual teams can provide insights into how project risk and project success are influenced and mediated by the team's adaptive structuration processes. (Dennis & Garfield, 2003, Hinds & Bailey, 2003; Qureshi & Vogel, 2001).

Swift Trust Theory, as conceptualized by Meyerson, Weick, and Kramer (1996), provides a distinctive framework to comprehend the dynamics of trust in virtual team settings. While conventional team environments see trust developed over extended periods through consistent interactions and shared experiences, virtual teams present a different narrative (Jarvenpaa, 1988). Swift Trust Theory postulates that in virtual environments, trust is often rapidly established during the early phases of team formation. This form of trust, described as "swift," is not grounded in long-standing familiarity but is rather underpinned by social categorizations, role-based expectations, and preliminary exchanges (Cursue, 2008). Essentially, swift trust acts as a provisional trust model, enabling virtual teams to operate efficiently even without the advantage of face-to-face rapport-building (Liao, 2017). Scholars exploring the realm of virtual teams have

identified Swift Trust Theory as a valuable perspective, illuminating the accelerated trust-building processes that bolster early-stage virtual collaborations (Jarvenpaa & Leidner, 1999). By integrating this theory into virtual team research, I not only enrich our understanding of trust dynamics in the digital age but also carve out valuable guidelines for managers and team leaders seeking to foster collaboration in dispersed teams.

By integrating these theories, the dissertation can provide a comprehensive theoretical framework for understanding the moderating effect of virtuality on project risk and project success. These theories offer insights into the communication processes, technology choices, social dynamics, and perceptions that shape virtual team performance. By applying these theories, the research can explore how virtual communication practices, adaptive structuration processes, and social presence influence the relationship between project risk and project success in virtual teams.

Table 1 Theories

Theory	Brief Description	Selected Publications
Social Information Processing Theory (SIPT)	SIP theory suggests that the velocities at which social information is exchanged vary between groups interacting face-to-face and those utilizing computer-supported communication methods	Chidambaram (1996), Walther (1995), Warkentin and Beranek (1999)
Adaptive Structuration Theory (AST)	AST, deriving its foundation from the structuration theory crafted by Giddens (1989), elucidates the evolution of groups within particular scenarios, particularly upon the incorporation of technology. The theory posits that a central objective of group activity revolves around adapting to the prevailing situation.	Garfield (2003); Hinds and Bailey (2003); King, and Ba, (2000); Krumpel (2000);
Swift Trust Theory	Swift trust theory primarily addresses the challenge of sustaining trust within virtual teams. While conventional trust models predominantly hinge on interpersonal relationships, swift trust minimizes the emphasis on these interpersonal aspects, instead fundamentally rooting itself in expansive, categorical social structures from the onset	Malhotra, Maznevski and Chudoba (2000); Qureshi and Vogel (2001)Jarvenpaa and Leidner (1999)

1.3 Research Objectives & Contributions

The overarching objective of this dissertation is to investigate the moderating effect of virtual communication on the relationship between project risk and project performance in virtual teams. By achieving this objective, the research aims to provide project managers with evidence-based recommendations for effectively managing project risks in virtual environments.

To fulfill this overarching objective, the following specific objectives have been identified:

This research, pivoting around the multifaceted domain of virtual teams and project management, embarks with a meticulous review of extant literature, aspiring to embed the inquiry within a robust theoretical matrix. The initial objective is to scrutinize the intersections and divergences amidst the realms of virtual teams, project risks, and project success in prevailing scholarly dialogues, thereby spotlighting potential research gaps, discernible patterns, and applicable theoretical frameworks that may steer the consequent research design and analytical undertakings. Following this foundational phase, the research endeavors to delve into the intricacies of the virtual team environment, particularly scrutinizing its potential moderating influence on the relationship between project risk and project performance. This objective, by dissecting how virtual communication dynamics could mold the trajectory and impact of project risks on their resultant outcomes, aims to unearth nuanced insights into the complex interplay between these pivotal variables. Such an analysis not only illuminates the theoretical discourse but also forges pathways for project managers to craft strategies that harness virtual communication to dampen the detrimental repercussions of project risks, thereby augmenting project performance within virtual teams. Culminating the research journey, the final objective seeks to distill practical, empirically backed recommendations for project managers, designed to

optimize project outcomes within virtual team contexts. These recommendations, curated from the research findings, will encapsulate insights into identified project risks, the influence of virtual communication on project performance, and its moderating effect on the nexus between project risk and performance. By coalescing these research findings into pragmatic strategies and guidelines, the research endeavors to arm project managers with actionable, evidence-informed insights, thereby bolstering their capacity to navigate project outcomes adeptly within the dynamic terrains of virtual team environments. In navigating through these delineated objectives, the research aims not only to augment the academic understanding of the confluence between project risk management and virtual communication within virtual teams but also to enrich the practical repertoire of project management practices amidst the perpetually evolving topography of virtual team configurations.

1.4 Research Question

To guide the investigation and address the research objectives, the following research questions have been formulated:

> *To what extent does the reliance on virtual communication moderate the relationship between project risk and performance?*

1.5 Structure of the Dissertation

The dissertation is structured as follows: Chapter 2 comprises a literature review that delves into the existing body of research on project risk, project performance, and virtual collaboration. This review serves as a foundation for the study, presenting a theoretical framework and introducing the theoretical model and hypotheses. Chapter 3 outlines the quantitative data collection methods, including the adaptation of existing constructs and measures, survey development, and the analytical methodology employed in this study. Chapter

4 presents the results obtained from the analysis of the survey data. Finally, Chapter 5, offers a discussion of findings, contributions, and limitations of the study, along with suggestions for future research endeavors.

1.6 Key Definitions:

Virtual teams can be defined as collections of individuals collaborating beyond traditional organizational structures, heavily anchored in electronic communication, and often spanning various geographical locales (Friedrich, 2017). In this research's framework, I define a virtual team as a collective of professionals who, within an organizational context, engage and collaborate primarily, if not exclusively, through virtual platforms. It is worth noting that events such as the COVID-19 pandemic have catalyzed the transition of many traditionally co-located teams to adopt a fully virtual mode of operation (Venkatesh, 2020).

Virtuality: The definition of virtuality denotes the degree to which a team operates in a virtual environment, often conceptualized as a spectrum (Ford et al., 2017). This suggests that teams usually don't operate strictly in face-to-face settings or purely virtual spaces but rather employ a combination of working methods (Gilson et al., 2015).

Project Performance is defined as a multi-dimensional assessment of a project success in achieving its pre-established objectives within set constraints (Muller, 2007). This encompasses both tangible outcomes, such as adherence to the budget, timely completion, and scope realization, as well as intangible aspects like stakeholder satisfaction, team unity, and the transference of knowledge. Within the research framework of this study, project performance will be delineated primarily by two pivotal indicators: adherence to the stipulated timeline (on time) and compliance with the allocated budget (on budget) (Atkinson, 1999).

Project Risks: are defined as the uncertainties or potential events that could adversely

influence the objectives, scope, or anticipated outcomes of a project (PMI, 2017).

Table 2 Key Definitions

Terms	Definition	Citation
Virtual Team	collections of individuals collaborating beyond traditional organizational structures, heavily anchored in electronic communication, and often spanning various geographical locales	(Friedrich, 2017, p.22).
Virtuality	the degree to which a team operates in a virtual environment, often conceptualized as a spectrum	(Ford et al., 2017, p.455).
Project Performance	multi-dimensional assessment of a project's success in achieving its pre-established objectives within set constraints	(Muller, 2007, p.345).
Project Risk	the uncertainties or potential events that could adversely influence the objectives, scope, or anticipated outcomes of a project	(PMI, 2017, p.237)

CHAPTER 2: LITERATURE REVIEW & HYPOTHESES

This chapter delves into the current literature that underpins the research objectives. The review unfolds over three distinct sections. The initial section addresses the virtual teams' literature serving as the foundation for this study. The subsequent section examines the project management body of literature with a focus on project outcomes and project risks. The concluding section formulates the model and hypotheses relevant to the study.

2.1 Virtual Teams Body of Literature

2.1.1 Evolution of Virtual Teams

The term virtual originated from the word virtue in the early 1300s (Chudoba et al., 2005). However, by the late 20th century, it evolved to mean "being temporarily simulated by computer software (Ebrahim et al., 2009). Historically, groups of individuals from diverse cultures would collaborate in a singular location to attain a specific objective. The growth of technology, marked by the rise of personal computer sales in the 1960s, followed by mobile phones in the 1970s, voice mail systems in the 1980s, and the proliferation of the internet in the 1990s, paved the way for digital spaces (Ebrahim et al., 2009). Presently, virtual teams represent a contemporary organizational paradigm, navigating the complexities and limits of the modern corporate world (Gilson et al., 2015).

In the context of the United States, Work teams have been present since the 1960s. However, it was not until the Total Quality Management wave in the 1980s that teams and quality circles saw extensive adoption. During the late 1980s and early 1990s, many firms transitioned to self-directed using project management techniques (Ebrahim et al., 2009). The aim was to trim down administrative layers, expedite processes, and enhance service quality. By the mid-1990s, several major corporations started introducing the team model to their

international branches across Asia, Europe, and Latin America. Their goal was to harmonize global HR approaches, as mentioned by (Kirkman et al., 2001). Today, due to advancements in communication tech, the ongoing wave of globalization, and the forced lockdowns due to the COVID-19 pandemic, there is a surge in the adoption of virtual teams globally (Herath & Herath, 2020). The contemporary period witnesses a rising trend toward virtual team frameworks within organizations (Venkatesh, 2020). Gilson et al., 2015 conducted a comprehensive literature review on virtual teams, noted that most organizational teams have some virtual elements. The shift has been from collaborating with nearby colleagues to working with individuals spread across the world (Gilson et al., 2015).

2.1.2 Definitions of Virtual Teams

In recent decades, scholarly interest in virtual teams has notably increased. According to Bell and Kozlowski (2002), virtual teams operate across temporal and spatial separations using electronic tools to achieve set objectives. In a similar vein, Hertel et al. (2005) described these teams as comprising members who, despite residing in different locations, organizations, or time zones, utilize digital communication means to work cohesively towards shared goals. Lin et al. (2008) further emphasized the role of digital communication technologies, defining virtual teams as dispersed groups united by these platforms. Taking a broader view, Ferreira et al. (2012) characterized virtual teams by their geographical, organizational, and temporal dispersion, all the while harnessing communication tools to meet organizational objectives. Orhan (2014) spotlighted the geographical distribution of team members, underscoring their reliance on digital communication tools, while Ford et al. (2017) described these teams as individuals spread either geographically or organizationally, primarily converging via communication technologies.

Geographical and temporal distribution, coupled with technological reliance, frequently emerge as foundational elements in the description of virtual teams. However, the scholarly discourse has expanded to encompass other significant dimensions as well. For instance, Kirkman et al. (2004) integrated the typical descriptors but also emphasized the presence of employees possessing distinct skills within virtual teams. They conceptualized such teams as assemblies of employees, scattered over varying time zones and geographical locations, yet unified by their distinctive skills and a collective aim. They engage collaboratively, propelled by contemporary communication tools. Additionally, a salient advantage underscored in the current trajectory of virtual teams is the organizational flexibility to induct the most competent, or perhaps specifically skilled individuals into project-oriented teams (Verburg et al., 2013).

Eisenberg et al., (2016) highlighted familiar dimensions of virtual teams, such as geographical distribution and the primary use of communication tools. However, they uniquely emphasized the transient nature of virtual teams. According to their definition, team members often don't possess pre-established relationships and may collaborate for only a limited duration. In a related fashion, Gibson and Gibbs (2006) portrayed virtual teams with inherent dynamism, indicating a regular change in team composition.

Given the diverse definitions surrounding virtual teams, it becomes imperative to consolidate the commonly referenced dimensions. These dimensions encompass geographical spread, variability in time zones or temporal dispersion, dependence on technological platforms, minimized in-person interactions, and the presence of members with distinctive skill sets. Additionally, there are boundaries in team relationships, an inherent fluidity in team composition, mutual reliance among members, short-lived team structures, and teams that are spread across distinct organizational units.

Of these outlined dimensions, geographical spread, temporal variability, and technological dependence are frequently highlighted in academic discussions. These dimensions are predominant due to their widespread applicability across various virtual contexts. However, characteristics like the temporary nature or the dynamic composition of teams might resonate more in specific scenarios rather than being universally applicable (Kelley & Sankey, 2007). Notably, the temporary characteristic of virtual teams can be closely associated with project management, where teams are often assembled for the duration of a particular project and disbanded upon its completion, underscoring the project-centric nature of many virtual collaborations.

2.1.3 Dimensions of Virtuality

Navigating the dimensions that should be incorporated into the definition of virtual teams presents one facet of uncertainty; another pertains to the intensity or degree of these dimensions. In contemporary organizational landscapes, distinguishing teams strictly as traditional or virtual poses challenges. The concept of virtuality offers insights into the depth of these dimensions, enhancing our capability to contrast and analyze both organizational and team contexts. A significant portion of the existing literature leans towards categorizing teams binarily: as either dispersed or co-located (Gilson et al., 2015). Only a handful of studies venture into the realm of defining and gauging the magnitude of team virtuality. This segment delves into research endeavors that have embarked on quantifying the degree of team virtuality.

Gibson and Gibbs (2006) portrayed virtuality as a composite construct encompassing four distinct facets: geographic spread, reliance on electronic modes, fluid organizational structures, and varied national backgrounds. While several definitions of virtuality touch upon these elements, what sets this apart is the conceptualization of these facets as standalone attributes

rather than a fused aggregate. Each of these elements is visualized on a spectrum. For instance, a team distributed across various states inherently demonstrates a higher degree of dispersion compared to a team scattered within distinct regions of one state. The ever-evolving organizational configurations dictate the nature of teams and their inherent roles. A member who is part of a longstanding or fixed team would be positioned differently on this spectrum compared to someone engaged with multiple transient project teams. For their inquiry, Gibson and Gibbs (2006) employed a qualitative approach, examining 14 teams from 16 global entities. The extent of geographic spread was quantified by evaluating the total sites and the headcount at each. Interview-derived data was systematically coded to gauge the intensity of electronic reliance, with gradations ranging from low to high based on the data. To discern the fluidity in organizational structures, historical records such as org charts, team directories, and corporate archives were used as markers to determine the level of structural evolution. Finally, the spectrum of national backgrounds within teams was assessed by leveraging team diversity research, focusing on the range of national origins present within the team.

Chudoba and colleagues (2005) introduced an index to gauge the degree of virtuality within specific settings, taking into account factors like geographical spread, time zones, cultural aspects, work habits, organizational methods, and technological tools. A 12-item set encompassing three core facets: (1) the team's geographical distribution extent, (2) the duration members spend working outside their regular office premises, termed as workplace mobility, and (3) the diversity in both cultural backgrounds and work methodologies, referred to as the variety of practices.

In their comprehensive examination of virtual teams, O'Leary and Cummings (2007) embarked on an exploration to ascertain the degree of geographical dispersion inherent within

virtual teams. They delineated several traits pertinent to geographic dispersion: the spatial aspect, denoting the physical distance separating team members; the temporal element, reflecting time zone variations among members; site, highlighting distinct locations where members operate; isolation, which defines the degree to which individuals work independently; and imbalance, which sheds light on the uneven distribution of members across varied sites. The scholars formulated index scores for each trait, contingent on the team's structure. This investigation offers a nuanced perspective on geographic dispersion; however, it falls short of presenting a holistic understanding of how these dimensions interconnect or converge into an overarching metric of team dispersion. Another constraint in the realm of virtuality is the study's exclusive focus on geographic dispersion. Prior discussions have underscored several other dimensions, encompassing technological adoption, organizational protocols, and diversity, which might shape a team's degree of virtuality. Notwithstanding these constraints, the dispersion measurement methodologies devised by O'Leary and Cummings (2007) have been widely adopted by subsequent scholars probing into the depths of team virtuality.

Schweitzer and Duxbury (2010) discerned a compelling need for refining the definition of virtuality, advocating for its portrayal on a spectrum rather than merely as a binary concept. Through a meticulous exploration of existing literature, they discerned that virtuality predominantly centers around certain attributes, including the reliance on communication technology, geographical distribution of team members, crossing of organizational boundaries, and temporal considerations such as disparate time zones or fluctuating work schedules. Nevertheless, Schweitzer and Duxbury (2010) felt these definitions were somewhat lacking, leading them to propose an alternative conceptualization of virtuality. Their novel approach hinged on three distinct dimensions: the proportion of solitary work by individuals, the

prevalence of team members engaging in virtual work, and the spatial divergence amongst team members. The duo then operationalized these dimensions, gauging the solitary work proportion through the ratio of virtual work hours to total work hours, and ascertaining the prevalence of virtual workers by examining the fraction of team members stationed in varied office locations

As highlighted in the aforementioned definitions, In the scholarly literature, the conceptualization of virtual teams displays considerable variation, paralleling the definitional challenges encountered with the notion of virtuality. A review of the literature (as summarized in Table 2) reveals that virtuality encompasses a myriad of dimensions, such as the employment of virtual communication tools, the informational value these tools provide, and the synchronicity of their communications. Other defining factors include the scarcity of face-to-face interactions, the geographical scattering of team members, a heavy reliance on electronic mediums, the fluidity of structural arrangements, and the inclusion of diverse nationalities. The list extends to incorporate discontinuities arising from divergent physical locations, time zones, and cultural backgrounds, as well as varied colocation patterns, asynchronous work routines, the frequency of electronic communications, the count of in-person meetings, the spread of team members, and their proclivity for workplace mobility.

Interestingly, the dimensions characterizing virtuality frequently mirror those enlisted for virtual teams. However, a crucial distinction arises in the representation of these dimensions. In the context of virtuality, these dimensions are perceived to lie on a spectrum, rejecting the binary characterization of their mere presence or absence. Therefore, the discourse shifts from designating a team as co-located or geographically dispersed to assessing the degree of virtual communication used among team members.

Table 3 Virtual Team Definitions

Publication	Key Contributions to VT Definition	Dimensions of Virtuality		
		Geographic Dispersion	Temporal Dispersion	Technology Reliance
Lipnack and Stamps (1997)	Virtual teams consist of individuals who collaborate using communication tools to accomplish tasks that rely on each other, all while working from different locations, across various time zones, and within distinct organizations	X	X	X
Bell & Kozlowski (2002)	Virtual teams collaborate across temporal and spatial boundaries using digital platforms to unite their efforts and reach shared objectives	X	X	X
Griffith et al. (2003)	A group of individuals who work across time, space, and organizational boundaries with links strengthened by webs of communication technology	X	X	
Kirkman et al. (2004)	Virtual teams consist of skilled professionals located in different areas who rely on technological means to collaborate and complete significant tasks for their organization	X		X
Powell et al. (2004)	Virtual teams are assemblies of individuals located in various geographic or organizational locations who leverage information and telecommunication tools to achieve specific organizational objectives	X		X
Chudoba et al. (2005)	Virtual teams are groups of individuals who, driven by a shared objective, use digital communication tools to collaborate on tasks, even though they are spread across various time zones and belong to different organizations			X
Gibson & Gibbs (2006)	Virtual teams are characterized by members scattered across locations who mainly depend on electronic means of communication and often have diverse backgrounds	X		X
Kirkman & Mathieu (2005)	Virtual teams consist of members who collaborate using digital communication methods to achieve tasks with a mutual goal, operating from diverse time zones and different organizations	X		X
Lin et al. (2008)	Virtual teams refer to collaborative groups distributed across different time and places, relying on digital communication tools to work on a specific project	X	X	X
Schweitzer & Duxbury (2010)	A virtual team consists of members who, due to their diverse locations and schedules, don't have the opportunity for regular in-person interactions	X	X	X

Table 3 Virtual Team Definitions (continued)

Orhan (2014)	A virtual team is a collection of individuals spread geographically who predominantly communicate through electronic means	X	X
Ford et al. (2016)	Virtual teams are made up of individuals from various geographic or organizational backgrounds, whose primary coordination occurs through a blend of telecommunications and advanced communication technologies to achieve a shared goal	X	X
Kramer et al. (2017)	Virtual teams are envisioned as collaborative units that cross physical and institutional borders and rely heavily on technology for effective communication and operation	X	X

2.1.4 Definition of Virtuality in the Context of the Dissertation

Drawing from the dimensions of virtuality discussed earlier, this dissertation narrows its research framework specifically to the technological reliance component of virtuality for the current study. Technological advancements, particularly in communication, have emerged as pivotal enablers in virtual environments, thereby making the degree of such reliance an imperative dimension to measure (Chudoba et al., 2005). Technology aids in streamlining work coordination and facilitating communication among team members (Ayoung et al., 2011). However, it is evident that the boundary between traditional and virtual teams is becoming increasingly ambiguous. Griffith et al. (2003) suggested that the extent of a team's virtuality might be more aptly represented on a continuum. In contemporary settings, even teams traditionally regarded as face-to-face are leaning heavily on communication technologies for their tasks.

Kirkman and Mathieu (2005) upheld the notion that virtuality is a multi-faceted construct. Contrary to some opinions, they posited that geographic dispersion shouldn't necessarily be a hallmark of virtual teams. They observed that even teams operating in close proximity might leverage communication technologies, exhibiting high levels of virtuality. Their definition of

virtuality pivoted around three key dimensions: the extent of virtual communication tools usage, the informational value derived from these tools, and the synchronicity of team interactions.

Furthermore, Hoch and Kozlowski (2014) gauged team virtuality considering the volume of electronic communication. Their assessment of electronic communication encompassed diverse channels like e-mail, phone, instant messaging, video, and direct interactions. To decipher the proportion of electronic communication, they compared the aggregate of electronic mediums against the total communication. The methodology adopted by these authors was commendable, offering an in-depth perspective on communication channels and quantifying the extent of electronic communication utilization.

2.1.5 Recurring Themes in Virtual Teams Research

Virtual teams offer a distinct set of opportunities and challenges relative to their face-to-face counterparts. Engaging in a virtual team setup often translates to numerous advantages for team members. A predominant scenario for these teams is members working from their homes. Such individuals have cited the absence of daily commuting as beneficial, leading to time and financial savings, and enhancing their work-life equilibrium (McMurtrie & Kostya, 2021). Furthermore, according to McMurtrie & Kostya (2021) these individuals claim enhanced performance marked by heightened focus, increased productivity, and diminished stress. This surge in efficiency may stem from the autonomy to tailor their workspaces, which allows them to minimize disruptions and selectively engage with colleagues, especially avoiding those with whom there might be compatibility issues. However, it's worth noting that while home remains a prevalent workspace for many in virtual teams, Liao (2017) highlighted that several professionals relish the flexibility of operating from diverse locations as per their daily preference.

Virtual teams bring forth a plethora of opportunities, alongside aspects that require nuanced management. These aspects encompass areas such as trust, conflict, communication, and technology reliance, as emphasized in numerous studies (Friedrich, 2017; Gamero et al., 2021; Liao, 2017). This section will explore each of these areas in depth.

2.1.5 Trust

Establishing trust within virtual teams is a pivotal aspect underscored by numerous studies (Liao, 2017; Zeuge et al., 2020). Ford et al. (2017) stressed the role of trust as the glue binding virtual teams and aligning them with the organizational objective. Given the nature of virtual teams where members can't observe others directly, the essence of trust intensifies. This trust ensures belief in each member's contribution to their role. Marlow et al. (2017) found the level of trust to be even more crucial as the degree of virtuality amplifies. Trust plays multiple roles; Friedrich (2017) associated it with reducing conflicts and fostering creativity. Furthermore, they contend that trust-centric teams showcase improved efficiency and effectiveness, providing members with a conducive environment to work without fear of judgment.

Interestingly, swift trust emerges in virtual teams, particularly those with short-lived collaborations (Liao, 2017). Ford et al. (2017) and Liao (2017) describe this as rapidly-formed trust during the inception of a team, rooted in initial exchanges, stereotypes, and perceived personalities. Such trust is initially assumed but evolves with ongoing team interactions.

In traditional teams, trust stems from tangible cues, but in a virtual setup, trust-building takes a distinct path and potentially a longer duration (Liao, 2016). The increasing virtuality amplifies trust's importance due to the diminished presence of physical cues (Marlow et al., 2017). Trust in this setup often emerges from witnessing other members' competencies. As

Marlow et al., (2017) suggest, the assessment of trustworthiness is based on members' adherence to deadlines, participation in meetings, and responsiveness to communication.

Conclusively, despite the recognized significance of trust in virtual teams, Alsharo et al. (2017) proposed that further research is warranted to delve into trust-building nuances, especially differentiating between globally dispersed teams and those localized within a single place.

2.1.5 Conflict

Although all teams encounter conflicts occasionally, virtual teams face unique intricacies regarding this issue. Conflict often manifests through non-verbal cues or spoken indications, which can be subtle or entirely absent in virtual environments (Alsharo et al., 2017). In virtual teams, there's a tendency for members to ascribe team hiccups to personal attributes rather than external factors, potentially leading to heightened conflicts (Liao, 2017). Such attributions can deter collaboration, diminishing team efficiency. Proactive conflict mitigation is thus essential for virtual teams. To reduce potential disagreements, teams could regularly solicit feedback, enabling early detection and cooperative solutions to issues related to team duties (Alsharo et al., 2017). Reframing conflicts in a constructive light can also be beneficial, presenting them as opportunities to refine team processes (Liao, 2017).

2.1.5 Communication

In any team setting, effective communication is paramount, but for virtual teams, it requires heightened attention to optimize its efficacy. Communication serves as the conduit through which teams cultivate a shared understanding, an aspect that can profoundly influence both the satisfaction of team members and the overall team performance (Marlow et al., 2017). As posited by Liao (2017) the communication needs of virtual teams are approximately twice that of their

traditional counterparts, with observations indicating that top-performing teams engage in more frequent interactions than those performing at lower levels.

Virtual teams leverage technology exclusively for communication, be it through text, audio, or visual platforms. Such modes, albeit indispensable, present coordination challenges, making interactions less seamless than in-person discussions (Flavian et al., 2018). These platforms introduce distinct complexities in contrast to conventional face-to-face dialogues. Delving into this, Laitinen and Valo (2018) employed a frame category analysis to decode the essence of tech-driven communication in virtual teams. By studying three such teams and examining their virtual interactions, they discerned four frames delineating this communication form: practical, work, user, and relational. Within these, they unearthed nine technological interpretations, capturing facets ranging from the nuances of technology to challenges and guidance directions.

Moreover, the inherent challenge with tech-based communication is the curtailment of conventional non-verbal cues. Teams, instead, might resort to alternative non-verbal indications like response speed (Laitnen et al., 2018). Darics (2017) expounded that in written contexts, non-verbal elements are always intentional, utilized for accentuation, elucidation, or demarcating hierarchy. The reliance on text-based non-verbal cues in virtual teams can stimulate confusion due to potential misinterpretations. Yet, video interactions offer a semblance of non-verbal interactions, offering a richer communicative experience (Marlow et al., 2017). Darics (2017) further scrutinized virtual team communication strategies, unveiling that many techniques were relationally oriented, aiming to elucidate thought processes, convey emotions, or replicate auditory nuances. Project managers often employ transactional strategies, communicating hierarchy or clarifying intentions.

It's crucial to tread cautiously in written communication, emphasizing the choice of words, phrasing, and the communication medium. Ensuring understanding by soliciting feedback is equally vital, as is contemplating the modality's efficacy based on the communication's intent (Gamero et al., 2021).

Friedrich (2017) introduced the Virtual Team Maturity Model in their publication, which extends an evaluation methodology – the Virtual Team Maturity Model (VTMM) – encompassing 11 communication processes tailored for virtual teams. Developed after observing student virtual teams, the VTMM emphasizes inputs, methods, outputs, and performance metrics to gauge team maturity. Upon implementing this model, Friedrich discerned improved team performance, suggesting its applicability for virtual teams to fortify communication. However, Friedrich also recommended further studies to gauge the productivity of virtual teams vis-a-vis traditional teams and to decipher how communication interplays with other pivotal virtual team elements like trust and shared knowledge.

2.1.5 Technology Reliance

Virtual teams are intrinsically dependent on technological tools for their operations, encompassing both communication and task execution. Eisenberg et al. (2016) emphasized the growing intricacy of virtual work, suggesting that possessing technological proficiency is transitioning from a valuable asset to a critical necessity within virtual teams. Gamero et al., (2021) delineated several technological challenges virtual teams might face, such as the insufficient computer literacy of members, inadequate electronic communication skills, or the lack of access to requisite tools, potentially due to budgetary constraints. Highlighting the diverse technical proficiencies of team members. Laitenen et al., (2018) suggested that team members' varying levels of technological adeptness could influence their task performance and

receptivity to novel concepts. Additionally, Laitinen & Valo (2018) indicated that a member's perception of a specific technological tool, shaped by their prior experiences or expectations, might determine their readiness to employ it. The significance of leveraging appropriate technological tools tailored to the team's needs in a virtual setting cannot be overstated. As noted by Ford et al. (2017), in the absence of such tools, teams might grapple with organizational trust issues. Echoing this sentiment, Friedrich (2017) contended that technology not only furnishes a medium for communication but also fortifies trust by validating the team's contributions.

2.2 Project Management Body of Literature

Over the past several decades, project management has transitioned from simply being a method to execute specific tasks within given budgetary and temporal constraints to becoming a strategically central practice in almost every organization. This ascent in the importance of project management has been paralleled by rigorous research, creating an extensive repository of knowledge on myriad topics associated with project management (Kloppenborg et al., 2000). Before delving deeper into the nuances of project management research areas, there is a need to establish a precise definition of a project. The Project Management Institute (PMI), regarded as the foremost professional body in the realm of project management, characterizes a project as a "short-lived endeavor aimed at producing a distinct product or service" (PMI, 2013). At its core, a project is an aggregation of tasks, collectively culminating in a unique product or service. It's pivotal to understand that while the overarching outcome of a project is singular, the individual constituent tasks might not always be unique. Even though these tasks are executed within a set timeframe, similar tasks might have been carried out in the past or could be undertaken in the future. Kerzner (1995) offers a more refined definition, presenting a project as an assortment of activities and tasks that aim to meet a specific objective in line with certain criteria, have clear

start and end points, consume resources such as finance, manpower, and equipment, and adhere to set financial parameters. The main objective of project management is to accomplish the pre-set project goals within the determined period, utilizing the available or designated resources and navigating all project risks. Although this seems clear-cut in theory, in practice, what constitutes project success might differ based on the perspective of different stakeholders. This nuanced aspect of success criteria has been a central topic of discussion and examination in academic circles. This discourse will subsequently provide a thorough review of literature pertaining to project success metrics and delve into key project risks that influence project outcomes.

2.2.1 Project Performance

The conceptualization of "project success" is a complex and multifaceted subject, constantly undergoing transformation within the broad spectrum of project management discourse (Muller, 2007). Since the dawn of academic research in this area, scholars and practitioners have grappled with the formidable challenge of establishing a universally accepted definition of what constitutes project success (Pinto & Prescott, 1988; De Bakker et al., 2010; Dvir & Shenhar, 2003). Historically, discussions and assessments of project success were predominantly anchored by the classic "iron triangle" of project management, which encapsulates three essential dimensions: time, cost, and quality (Atkinson, 1999). These parameters were considered the litmus test for any project's success, setting the benchmark for evaluations. However, as the field evolved, myriad other factors began to influence this conceptualization, ushering in diverse evaluation methods and frameworks. Yet, remarkably, the significance of the original "iron triangle" has not diminished. Even with the influx of new methodologies and with the passage of time, these core metrics—time, cost, and quality—continue to play a pivotal role, resonating prominently in many of the contemporary discussions

and assessments of project success (Atkinson, 1999; Shenhar et al., 2001). The sustained relevance of these traditional metrics underscores their foundational importance in the ever-evolving narrative of project success.

From a practical standpoint, the pinnacle of excellence is achieved when there's a meticulous adherence to fundamental parameters—namely, staying within allocated budgets, meeting predetermined schedules, and ensuring the delivery of the promised quality. Dvir et al. (2003), Hughes et al. (2017), and Project Management (2018) all emphasize this confluence of factors as an symbol of superior project management. The importance of mastering these metrics isn't solely about accolades but has real-world ramifications. Wallace et al., (2004) delved into the detrimental outcomes of failing to properly manage these core metrics. Their research underscored that even minor lapses or deviations in either of these three critical dimensions can jeopardize the overarching success of a project. Their assertions aren't solitary; a comprehensive meta-analysis by De Bakker et al. (2010) bolstered this stance. Their study, which examined IT project evaluations spanning over a decade (from 1997 to 2009), found that an astonishing two-thirds of these evaluations consistently resonated with the traditional triadic benchmarks—scope, time, and cost—as the primary yardstick for determining project success. This underscores the enduring relevance and weight of these traditional metrics in shaping the narrative of project success across sectors and timeframes. However, it's pivotal to recognize that while all projects invariably operate within the boundaries of cost, time, and quality (Chen et al., 2009), achieving a harmonious balance often necessitates trade-offs (Nidumolu, 1996). This gives rise to a pivotal query: is adhering to traditional benchmarks synonymous with project success? There's a growing consensus that it isn't. Even if a project conforms to these conventions, it may falter in satisfying crucial user, customer, or broader stakeholder expectations (Hughes et al., 2017).

Zhang et al. (2018) further convolutes this definition, suggesting that in contexts like outsourcing, success is predicated on factors like overall satisfaction, the realization of set objectives, and the longevity of outsourcing affiliations—metrics that are tangentially related to the traditional triad.

Approaching the matter from a holistic perspective, the notion of project success emerges as multifaceted and intricate (Muller, 2007). It becomes clear that the definition of success isn't confined to a singular, rigid framework, nor does it progress in a straightforward trajectory. Instead, it demands an intricate, multi-dimensional evaluation that has the adaptability to capture varying shades of stakeholder perspectives. This encompasses not only the insights of project managers and their dedicated teams, who are deeply enmeshed in the project's execution, but also those of end-users and clients, whose expectations and needs drive the very essence of the project (Dvir et al., 2003; Hughes et al., 2017).

In many real-world instances, the contrast of diverse metrics and stakeholder expectations becomes especially pronounced. For instance, a project might meet all its predefined objectives, adhering closely to the set timelines, budgetary constraints, and quality standards. Yet, despite this adherence to conventional metrics, the project could still be deemed a failure if it fails to resonate with its intended audience, or if it falls short of fulfilling their unique needs or aspirations (Hughes et al., 2017; Pinto & Prescott, 1988). This underscores the imperative to look beyond traditional measures and embrace a more encompassing, dynamic, and stakeholder-centric approach when evaluating the success of any project.

Venturing further into the layered complexities of project evaluation methodologies, the seminal work of Wallace et al., (2004) presented a discerning dual classification for understanding success parameters: product performance and process performance. The product

performance criterion is primarily concerned with assessing the tangible outcomes of a project—be it a product, service, or solution. Here, the spotlight is on characteristics such as the end product's quality, its responsiveness to stakeholder needs, and its overall functionality, potentially serving as a yardstick for stakeholder satisfaction (Keil et al., 2013).

Conversely, process performance offers a closer examination of the journey that culminates in the product (Wallace et al., 2004). It navigates through the avenues of how the project was orchestrated and implemented. This involves critically analyzing aspects like adherence to the stipulated budget, maintaining the proposed timelines, and ensuring that resource utilization was optimal, among other facets—all of which find their roots in traditional evaluation matrices such as cost-efficiency and scheduling predictability (Nidumolu, 1996).

What makes Wallace and Keil's bifurcation particularly illuminating is the spotlight it sheds on the sometimes disjointed nature of project success. A project might meticulously follow every step in its planned trajectory, showcasing commendable process performance, yet might still falter when it comes to the end deliverable, indicating gaps in product performance. Conversely, there might be projects that deliver an impeccable product but whose journey is riddled with inefficiencies and challenges.

For the purposes of this study, the investigative lens pivots decisively towards process performance. This emphasis emerges not only due to its foundational standing in traditional project evaluation but also because of the weightage it has been accorded as a pivotal determinant of project success in contemporary scholarly discourse (Keil et al., 2013). This choice aims to further the understanding of how projects navigate their execution journey and how this journey, in turn, becomes a critical marker of overall success.

Table 4 Project Success

Publication	Time	Cost	Other Criteria
Boehm (1991)	X	X	quality
Nidumolu (1996)	X	X	quality
Pinto & Prescott (1988)	X	X	scope and quality
Keil et al., (1998)	X	X	risk management
Pinto & Slevin (1999)	X	X	scope and quality
Atkinson (1999)	X	X	scope and quality
Cooke-Davies (2002)	X	X	scope and quality
Wallace et al., (2004)	X	X	product performance
Muller (2007)	X	X	benefit realization
Ika (2009)		X	team satisfaction
Kernzer (2009)	X	X	scope and quality
Muller & Jugdev (2012)	X	X	scope and quality
PMI (2013)	X	X	scope and quality
Liu (2016)			quality
Zhang et al., (2018)		X	team satisfaction

2.2.2 Project Risks

Managing projects encompasses navigating a wide range of complexities and intricacies, rendering it far from a straightforward endeavor (PMI, 2017). Successful project realization hinges on the adept implementation of established project management methodologies, as detailed in resources like the PMBOK. Inherent risks permeate projects (Boehm, 1991; Menezes et al., 2019 Wallace et al., 2004; Zhang et al., 2018). One of the crucial elements for a project's successful culmination is the identification and mitigation of these risks (Liu, 2016; Zhang et al., 2018). Empirical studies in the domain of project management have underscored the multitude of risks that can hamper project performance (Liu, 2016; Zhang et al., 2018), emphasizing the need for early risk detection. Consequently, a rich body of literature has zeroed in on discerning risk

factors during the project lifecycle, aiming to bolster project managers in their risk management endeavors (Baccarini et al., 2004; Cooke-Davies, 2002).

Research encompassing project managers has been conducted across a diverse set of environmental factors, including countries where the project took place and nationalities of the project managers. A significant finding from this body of research is the consistent presence of risk factors across these varied cultural contexts (Boehm, 1991). Recognizing and comprehending these risks is imperative for managerial professionals; such understanding enables them to adeptly navigate project-related risks, optimize project outcomes, and conserve valuable resources (Liu, 2016).

In the realm of project management, risk management is predominantly approached in two phases: initial identification and assessment of risks followed by risk mitigation (Boehm, 1991). The inception phase entails discerning potential threats during project progression, gauging their likelihood, and determining their potential financial repercussions should they transpire. The efficacy of risk management is questioned in the absence of robust tools that aid in risk detection (Gupta et al., 2019). A substantial volume of research has explored themes related to project risks, both successes and failures (McLeod & MacDonell, 2011). Articles have delved into topics like software development risks (Wallace & Keil, 2004), software implementations (De Bakker et al., 2011), and myriad other areas such as outsourcing, new product development, construction, and IT governance.

The research methodologies employed span a diverse range, including observations from practitioners (Boehm, 1991), qualitative inquiries (Menezes, 2019), and even the formation of theoretical frameworks (Liu, 2016;; Nidumolu, 1996; Wallace et al., 2004). However, the increasing volume of studies pinpointing poor project performance indicators underscores a

prevailing ambiguity regarding its root causes (Gupta et al., 2019). These indicators of project risk, failure, and success manifest multifaceted dimensions and exhibit intricate interconnections (Wallace et al., 2004).

To navigate the extensive risk-related literature, specific systematic literature reviews and meta-analyses were reviewed. Articles from studies like Menezes et al. (2019) and Gupta et al. (2019) and Boehm (1991), formed the foundational literature for this review.

Research in risk management has diligently endeavored to establish correlations between risk and performance, providing project managers with frameworks to preemptively identify and counteract potential risks before they escalate into significant threats (Bakhshi et al., 2016). Boehm (1991), often revered as the pioneer in risk management, emphasized its essence, highlighting that effective risk management not only precludes the need for revisions in finalized project segments and project cancellations due to unmet expectations but also propels projects towards successful completion (Menezes et al., 2019). To evade such pitfalls, it's paramount that risks pertinent to a project are promptly recognized, evaluated, and subsequently addressed (Wallace et al., 2004).

The literature on project risk predominantly emphasizes assessing the detrimental impact of risk on project outcomes (Nidumolu, 1996; Wallace et al., 2004). It calls for further empirical exploration of these relationships. Therefore, synthesizing the comprehensive insights derived from the aforementioned literature, it becomes evident that the understanding and management of project-related risks transcends the boundaries of mere methodology and delves into a realm requiring a merger of empirical and pragmatic knowledge. The “so what” implication herein surfaces as a signaling to the project management society to elevate their perceptiveness towards an integrated risk management approach, which not only assimilates structured methodologies

and empirically derived data but also duly acknowledges the nuanced variables introduced by environmental factors. Consequently, while methodologies such as the PMBOK offer structured approaches and frameworks, the essence of adept project management rests heavily upon the ability to interweave these strategies with an innate understanding of project-specific, contextual, and environmental variances (PMI, 2017). The definitive objective thus pivots towards fostering an adaptive risk management culture, wherein methodologies and practices evolve coherently with the dynamic nature of projects and their associated risks. To pragmatically propel projects towards success, future research and practice must concurrently emphasize the development of robust, adaptive tools and frameworks that synergistically align structured risk management methodologies with the nuanced, empirical, and contextual variables that invariably permeate the project management landscape. This strategic fusion will not only enhance the probability of project success but also substantiate the evolution of project management as a discipline, reinforcing its pertinence and applicability across diverse domains and contexts.

Table 5 Select Review of Project Risks

Publication	**Methodology**
Abdullah & Verner (2012)	Qualitative
Keil et al., (1998)	Empirical
Baccarini et al., (2004)	Empirical
De Bakker et al., (2010)	Literature Review
Gupta et al., (2019)	Literature Review
Hughes et al., (2017)	Literature Review
Menezes et al., (2019)	Literature Review

2.3 Theoretical Model & Hypotheses

Previous research endeavors have predominantly zeroed in on pinpointing risks associated with projects (Menezes et al., 2019). However, only a select portion have meticulously explored the interplay between risk factors and performance outcomes (Wallace, 2004) Such

investigations emphasize the essence of not only recognizing but also efficiently governing risks to ensure that project goals are seamlessly met (Menezes et al., 2019). Additionally, the research consistently points toward an inverse interrelation between risks and project deliverables, indicating the pivotal importance of adept risk management (Liu, 2016).

In a seminal study, Wallace and his team (2004) delved into empirical relationships connecting six distinctive risk domains to a pair of performance metrics. Their innovative approach outlined 6 risk domains, encompassing facets from requirement stipulations to user considerations, culminating in a holistic 27-element perspective. Drawing from Nidumolu (1995), they contrasted this with two core project performance constructs. The outcomes revealed intriguing correlations: a positive interlink among the diverse risk areas and a converse relationship between risk parameters and performance benchmarks. Subsequent scholarly endeavors (Liu, 2016) have resonated with these findings. Expanding on this, specific studies (Zhang et al., 2018) have further explored and validated these relationships across different performance dimensions.

Deriving inspiration from the above, added that we are living in an era where virtual communication plays an integral role in managing projects, my conceptual model below omits the “planning and control risk” and “technology newness” dimensions, pivoting instead towards a robust, focused investigation into the domains of user risk, requirement risk, team risk, and organizational risk. The rationale behind eliminating "planning and control risk" is rooted in the anticipation of mitigating self-presentation bias by project managers (Arkin et al., 1980). Given the intrinsic involvement of project managers in planning and control activities, there is a conceivable inclination towards responding in a manner that protects their professional self-image, thereby compromising the authenticity and reliability of the data (Aga et al., 2016). On

the other hand, the exclusion of the "technology newness" dimension, originally employed by Wallace, is considered prudent to prevent any confusion with virtual communication tools utilized in project management. There's a subtle yet critical distinction between the technology inherent to a product being developed and the technology utilized in managing the project – a nuance that could potentially skew the findings should this dimension be retained.

Taking a deep dive into the chosen dimensions, the model examines the undercurrents between the outlined risk types and project performance within a virtual environment. User risk explores the possible threats and uncertainties arising from client or end-user interactions and their requirements (Davis, 1982). Requirement risk assesses the potential hazards emanating from ambiguity, volatility, or misalignment of project requirements (Jones, 1994). Team risk endeavors to scrutinize the possible pitfalls related to team dynamics, communication, and collaboration, particularly under the virtual working paradigm (Schmidt et al., 2001). Lastly, organizational risk probes into the systemic and structural vulnerabilities that could possibly impede the project, considering factors such as organizational structure, culture, and resource allocation (Schmidt et al., 2001).

The model also incorporates control variables, namely the age of the Project Manager (PM), experience, industry type, project deliverable, and project duration, which have been empirically recognized to exert influence on project success (Badewi, 2016). Here, the age of the PM and experience are viewed as possible indicators of accumulated knowledge and expertise, which may in turn impact risk assessment and decision-making proficiency (Carvalho et al., 2019). Industry type introduces sector-specific nuances and challenges that could invariably impact risk and performance paradigms (Muller, 2007). Project deliverables and duration, on the

other hand, symbolize the tangible and temporal outcomes, which may themselves introduce specific risk variables into the project management arena (Atkinson, 1999).

Positioning the model within a virtual project environment endeavors to contrast conventional risk dimensions against the unique challenges presented by virtual interactions and collaborations. By navigating through the identified risk dimensions and meticulously integrating control variables, this model aims to provide a granulated insight into the risk-performance nexus in virtual project environments. Future empirical investigations and practical applications of this conceptual model could potentially unravel novel findings, illuminating the pathways to mitigating risks and enhancing project performance in a digitized, interconnected world.

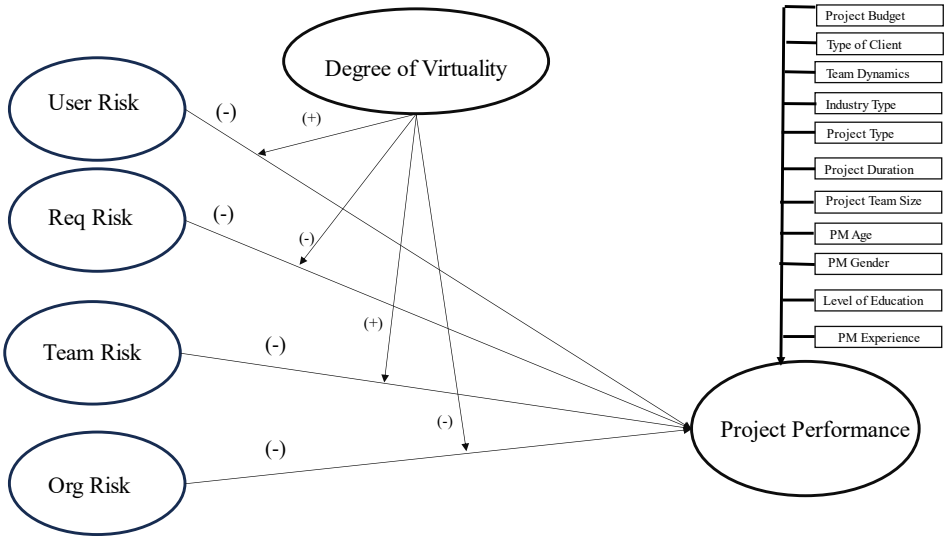

Figure 1 Conceptual Model

2.3.1 Main Effect Hypotheses

Organizational Environment Risk and Project Performance

Embodying the concept of organizational risk, it signifies an envelopment of uncertainties that are inherently woven into a project's encompassing organizational context,

offering a lens through which the varied, subtle, or pronounced, challenges born from the organizational environment can be perceived and analyzed (Liu, 2016). Pertinent literature has iteratively underscored the significant impact that a tempestuous organizational setting, often hallmarked by internal politics, structural instability, and a potentially palpable absence of support, can mete out on the smooth advancement of a project (Ewusi-Mensah & Przasnyski, 1991; Jarvenpaa & Ives, 1991; Jones, 1994).

Within this tapestry, the facets of organizational politics emerge not merely as strategic maneuvers but as potential quandaries that may introduce barriers to project processes, occasionally fostering a milieu where the reallocation of resources, shifting of priorities, and alignment (or misalignment) of project goals with organizational objectives become sources of crucial risk (Gupta et al., 2019). This, conjoined with organizational instability, which may manifest in forms ranging from financial flux to leadership vacuums, amplifies the intricacies involved in navigating project pathways, often imposing additional layers of decision-making complexity and necessitating the embedding of adaptive strategies within project plans (Gupta et al., 2019).

Moreover, the dimension of sufficient organizational support, or conversely, its scarcity, equally threads into this complex interplay. Projects, especially those of substantial scale or those venturing into innovative territories, often hinge upon a symbiotic relationship with their parent organization, wherein the allocation of resources, the provision of expertise, and the facilitation of requisite approvals and infrastructure become integral to their fruition (Boehm, 1991). In scenarios where these pivotal supports wane or are ensnared in bureaucratic tapestries, the trajectory towards successful project execution not only becomes mired in unforeseen challenges

but also renders the attaining of project objectives an increasingly arduous endeavor (Wallace et al., 2004).

Hence, understanding of organizational risk, particularly in recognizing and navigating the nuanced challenges embedded within the organizational context, becomes paramount. Not merely as a mechanism to preempt potential hurdles but as a tool to strategically align projects in a manner that they can, where possible, leverage organizational dynamics to their advantage, or at the very least, mitigate the potential impediments that might arise from them. This navigation between harnessing opportunities and averting challenges within the organizational context, therefore, becomes a vital underpinning to fortifying projects against the multifold challenges that might cascade from the inherent unpredictability of organizational terrains.

H1: Organizational environment risk has a negative effect on project performance.

User Risk and Project Performance

The intricacy of risk associated with users extends far beyond surface-level considerations, piercing into the depth of their interaction, involvement, and overall stance towards the system that's in the throes of development (Zhang et al., 2018). As we navigate through the myriad of complexities surrounding user-related risk, we inevitably find ourselves entwined in a network of elements that primarily hinge upon their degree of active involvement and, moreover, their underlying attitude which invariably casts a significant impact on the developmental ecosystem (Liu, 2016). It is this singular complexity, wherein when users find themselves either marginalized or willingly retreat into a space of negativity and reluctance, that a substantial threat is posed to the nourishment and eventual maturation of a project. Their cooperation, thus becomes not merely a contributory factor but essentially a linchpin that could potentially either uplift or undermine the project’s trajectory toward success.

This principle finds its foundation deeply rooted within a multitude of studies, with researchers having consistently illuminated the potent connection between the degree of user involvement and the project's fate. Davis (1989), among others, has substantiated this perspective, identifying a conspicuous pattern where an acute lack of user involvement surfaces not merely as a challenge but rather a recurrent and notably substantial risk factor. Such absence or deficient user participation thereby perilously steers the project toward a precarious brink, where potential failure looms with an increasingly tangible presence.

The phenomenon isn't merely a theoretical construct but echoes a palpable reality witnessed across varied project landscapes. Projects, especially those vested in system development, invariably find themselves tethered to the whims and investments of their user base. Thus, understanding, predicting, and navigating through the terrain of user-related risks essentially pivots upon a thorough exploration of user behavior, expectations, and synergistic involvement with the system in development, warranting a dedicated focus to comprehend and potentially mitigate the risks emanating from this critical stakeholder group. This, therefore, underscores the pivotal role that user-associated risks assume, necessitating a multifaceted, adaptive, and keenly insightful approach towards user engagement and management throughout the developmental lifecycle (Nidimulu, 1995).

H2: User risk has a negative effect on project performance.

Requirements Risk and Project Performance

Requirements risks signify a pivotal domain within project management, intertwining the meticulous art and science of accurately deciphering, defining, and adhering to system requirements with the inherently chaotic and often unpredictable nature of project environments. The notion that uncertainties become prominently evident in the context of system requirements

is not purely a derivative of these requirements undergoing alterations or modulations during the project lifecycle. Rather, it emanates from a multifaceted network of challenges inclusive of, but not restricted to, the persistent ambiguities in understanding or interpreting requirements, incorrect or unfounded assumptions made during the planning or execution phases, and inadequate specifications that might inadvertently overlook critical aspects or nuances of the project (Boehm, 1991).

Boehm's insights, alongside those from Schmidt et al. (2001), underline a cardinal truth: when requirements, which serve as the foundational anchor, harbor defects or fall prey to miscalculations, the repercussions are not localized. Instead, they permeate throughout the project, transmuting into significant, and at times insurmountable, challenges. The challenges, thus, assume a compounded form, imperiling not merely the structural and functional fidelity of the project but also threatening to derail the alignment between the project's outputs and the initial, intended objectives.

Requirements risks, therefore, beckon an in-depth exploration and thorough understanding, ensuring that every potential ambiguity or inadequacy is systematically identified, assessed, and mitigated through a structured risk management process. Furthermore, acknowledging the profundity of the impact of requirements risks necessitates the infusion of meticulous attention, adept expertise, and a robust, adaptive strategy to navigate through the intricate labyrinth of challenges that these risks can manifest. In the grand tapestry of project management, understanding and mitigating requirements risks is not merely a task – it becomes an essential doctrine, guiding the seamless progression and ensuring the integral stability of projects across their diverse landscapes and throughout their varied lifecycles.

H3: Requirements risk has a negative effect on project performance.

Team Risk and Project Performance

Team risk, encapsulating a crucial facet of project management, illuminates challenges interwoven with the very individuals who are conferred with the responsibility of executing the project (Keil, et al., 2013). It extends beyond mere functionality and delves into the complexities tied to human resource management, capitalizing on a panorama where issues such as turnover, insufficient knowledge, and communication barriers can precipitate substantial uncertainty regarding the project's ultimate outcome (Han & Huang, 2007). A team environment that is punctuated with frequent turnover not only disrupts the project's continuity but also perturbs the synergy and collective knowledge inherent in a stable team. Insufficient knowledge, on the other hand, can lead to a palpable deficiency in both the strategic and tactical handling of project tasks, thereby endangering the fidelity and quality of the project outcome.

Intriguingly, the literature encapsulates a rich tapestry of insights regarding how the human element, in all its intricate dimensions, fundamentally shapes the trajectory of projects, particularly in the realm of software development. Schmidt (2001) and other scholars have underscored the paramount significance of aspects such as skills, team cohesion, and communication, delineating them as pivotal determinants in deciphering the fate of software projects. Skills ensure that the team is equipped with the necessary technical and managerial acumen to navigate through the various phases of the project. Cohesion, while nurturing a conducive and collaborative environment, fosters a collective identity and shared responsibility among team members. Communication, perhaps the most vital, serves as the lifeline that connects every individual and process within the project, ensuring clarity, coherence, and coordinated efforts.

The examination of team risk, thus, transcends the mere identification of potential issues and morphs into an exploration of the profound impacts that team dynamics can wield upon the intricacies and outcomes of a project. Ensuring teams are harmoniously calibrated – in knowledge, communication, and mutual respect – not only mitigates risks but essentially propels the project toward its envisioned success, substantiating the cruciality of the human element in project realms.

H4: Team risk has a negative effect on project performance.

2.3.2 Moderating Effect Hypothesis

Effect of Degree of Virtuality on Organizational Risk & Performance

The advent of digital transformation has increasingly led organizations to adopt virtual environments for executing projects. The degree of virtuality, defined as the extent to which organizations rely on virtual processes and communication tools to accomplish tasks, has significant implications for both risk and performance in project management. I hypothesize that the degree of virtuality serves as a moderating factor, influencing the relationship between project management practices and their outcomes in terms of risk and performance.

Literature suggests that virtuality can enhance project performance by facilitating flexibility, reducing overhead costs, and enabling access to a global talent pool (Gilson, Maynard, Jones Young, Vartiainen, & Hakonen, 2015). However, the degree of virtuality also introduces complexities in communication and coordination, potentially affecting project timelines and quality (Martins et al., 2004). In addition, the degree of virtuality influences organizational risk in several ways. While virtual tools can mitigate risks associated with geographical dispersion and time zone differences, they also introduce cyber security risks and

challenges in maintaining team cohesion (Taras et al., 2013). The balance between these factors is crucial for managing risk effectively in virtual settings (DeSanctis et al., 1999).

The impact of virtuality on organizational risk and performance is not uniform but depends on various factors, including the nature of the project, the industry, and the organization's readiness for virtual work (Hertel, Geister, & Konradt, 2005). Therefore, I propose the hypothesis below

> *H5: The degree of virtuality will negatively moderate the relationship between organizational risk and project performance.*

Effect of Degree of Virtuality on User Risk & Performance

Embarking on a meticulous exploration of technological influence and virtuality in project contexts, the Adaptive Structuration Theory (AST) provides a nuanced understanding, suggesting that while technology and virtual platforms pave the way for avant-garde channels for user engagement and feedback, they concurrently metamorphose the archetypal dynamics of user-system interactions (Schiller et al., 2007). The proliferation of virtual platforms not only magnifies the landscape of possibilities but also embroiders a more dynamic, continuous, and interactive milieu, potentially streamlining the assessment of user sentiment and fortifying their engagement in a fluid and interactive digital environment.

Underlining the effect of these virtual platforms, it is perceived that they have the potential to re-engineer user-system interactions by offering an interactive platform that not only sustains but potentially enhances continuous engagement. This engagement is not isolated but is intertwined with the necessity to comprehend and amalgamate user feedback and sentiment, thereby ensuring that the user remains an integral entity within the developmental journey of the system.

Swift Trust Theory, providing a juxtaposition, enriches our understanding of the psychosocial dimensions of virtual interactions. It unveils that trust, a cornerstone of productive interactions, can be agilely cultivated in virtual environments, taking root not in the profundity of shared histories, but paradoxically, in the initial exchanges and the specific roles that individuals enact (Crisp & Jarvenpaa, 2013). This becomes particularly salient when considering user risk; given that the involvement and disposition of users towards a system cascade into critical dimensions of this risk, the rapid fire ignition of trust in virtual environments may serve as a mitigator of negative user sentiments.

The swift construction of trust, therefore, becomes an invaluable asset, creating a milieu where users, despite being silhouetted against the challenges potentiated by virtuality, may become more receptive and amenable to active participation and collaboration (Ford et al., 2016). Within the cocoon of this collaborative trust, users could emerge as active participants, thereby not merely reducing the risk posed by negative sentiments but also enhancing the quality of interactions and feedback.

Anchoring upon the above, it materializes as conceivable that the degree of virtuality may well sculpt itself into a moderating entity, influencing the relationship between user risk and project outcomes (Gilson et al., 2015). In circumstances where projects are deeply entrenched within virtual contexts, the dynamics of swift trust and the expanded horizons for user engagement might not merely cushion but potentially neutralize the precipices posed by user risk, crafting a trajectory where user engagement and project outcomes evolve symbiotically in the digital realm. This intricate tapestry, therefore, necessitates further exploration, potentially unveiling strategies to harness virtuality, mitigate risk, and enhance project success.

H6: The degree of virtuality will positively moderate the relationship between user risk and project performance.

Effect of Degree of Virtuality on Requirements Risk & Performance

In the ever-evolving realm of project development, the intricate phases of innovation often require deep comprehension, seamless communication, and quick iteration (Lurey et al., 2001). The innate complexity of these phases demands more than just transactional exchanges; they benefit from the nuances of in-person dialogue. Face-to-face interactions facilitate an environment where ideas can be spontaneously challenged, refined, and expanded upon. These interactions provide an immediacy which is pivotal in disentangling complexity and driving innovation forward.

When we pivot to the topic of requirements risk in project environments, these in-person interactions become even more crucial. The real-time feedback loop that face-to-face meetings offer can be instrumental in ensuring that all stakeholders and project members have a clear, shared understanding of the system requirements. The subtleties of non-verbal cues, body language, and the energy in a room are aspects of communication that virtual environments cannot fully replicate.

Drawing from Social Information Processing Theory (SIPT), I understand that while virtual teams can and do develop robust interpersonal connections over time, the process is inherently slower compared to face-to-face interactions (Curşeu et al., 2008). SIPT emphasizes the role of verbal cues in virtual communication and how individuals adapt to the constraints of the medium over time. However, the iterative nature of project development, combined with the challenges posed by requirements risks such as ambiguity, frequent changes, or lack of clarity, could be further amplified in a virtual setting (Curşeu et al., 2008). This is particularly

concerning during the initial stages of a project when clarity and precision in understanding requirements are vital (Jarvenpaa et al., 2004). Delays in grasping and acting upon these requirements could adversely impact project performance. (Baltes et al., 2002; Hedlund et al., 1998; Hwang and Guynes, 1994; Hightower and Sayeed, 1996; Warkentin et al., 1997).

Given this context, I formulate Hypothesis 7 below:

> *H7: The degree of virtuality will negatively moderate the relationship between requirements risk and project performance.*

Effect of Degree of Virtuality on Team Risk & Performance

The intricate dance of project development is deeply tied to the dynamics of the team involved. Team risk encapsulates issues such as team member turnover, insufficient knowledge among members, lack of cooperation, motivational challenges, and communication disparities. In traditional co-located settings, these risks can be detrimental to the project outcome (Wallace et al., 2004). However, the dynamics shift interestingly in a virtual environment (Gilson et al., 2015).

Social Information Processing Theory (SIPT) posits that individuals, over time, adjust their communication strategies to fit the confines of the medium they are using. In the realm of virtual teams, this means a gradual development of relationships, trust, and understanding as they adapt to the limitations and opportunities of virtual communication (Walther, 1992). This adjustment can be a double-edged sword. On one side, as virtual teams spend more time together, they tend to develop richer modes of communication, often compensating for the lack of physical cues with enhanced verbal and written exchanges. On the other side, this adaptation period can initially exacerbate team risks, particularly if the team does not have the time or the proper mechanisms to foster this adaptive communication.

The concept of Swift Trust Theory further complements our understanding of team dynamics in virtual settings. In environments characterized by short time frames and task-specific objectives, teams often exhibit a form of "swift trust" – a willingness to suspend doubt about the trustworthiness of colleagues and act as though trust was already established (Meyerson et al., 1996). This phenomenon is particularly prevalent in virtual teams, where traditional trust-building exercises might be absent or limited. Swift trust can act as a mitigating factor against team risks, at least in the initial stages of a project. When swift trust is present, team members may be more forgiving of misunderstandings, more willing to share knowledge, and more motivated to cooperate, potentially enhancing project performance.

Marrying insights from SIPT and Swift Trust Theory, I arrive at an intriguing proposition: In a virtual setting, once past the initial adjustment period, the very challenges associated with team risk might transform into opportunities. The compounded effects of adaptive communication and swift trust could make virtual teams more resilient and innovative in the face of team-related challenges, potentially positively influencing project performance.

Given the combined insights from SIPT and Swift Trust Theory, hypothesize:

H8: The degree of virtuality will positively moderate the relationship between Team risk and project performance.

Table 6 Summary of Hypotheses

Project Risks & Project Performance	
H1	Organizational environment risk has a negative effect on project performance.
H2	User risk has a negative effect on project performance
H3	Requirements risk has a negative effect on project performance
H4	Team risk has a negative effect on project performance
The Moderating Role of Degree of Virtuality	
H5	The relationship between organizational risks and project performance has an interaction effect with the degree of virtuality, such that higher levels of virtuality make the relationship between organizational risks and performance more negative, whereas lower levels of virtuality make this relationship less negative.
H6	The relationship between user risks and project performance has an interaction effect with the degree of virtuality, such that higher levels of virtuality make the relationship between user risks and performance less negative, whereas lower levels of virtuality make this relationship less negative.
H7	The relationship between requirements risks and project performance has an interaction effect with the degree of virtuality, such that higher levels of virtuality make the relationship between requirements risks and performance more negative, whereas lower levels of virtuality make this relationship less negative.
H8	The relationship between team risks and project performance has an interaction effect with the degree of virtuality, such that higher levels of virtuality make the relationship between team risks and performance less negative, whereas lower levels of virtuality make this relationship more negative.

CHAPTER 3: RESEARCH DESIGN & METHODOLOGY

This section offers an in-depth description of the methods employed to examine the research model and assertions made in this dissertation. I started by presenting the framework of the research study, then delved into the participants and the sample calculations using G-power chosen and how data was gathered. Subsequently, I elaborated on the independent, dependent, moderating, and control metrics.

3.1 Overview

Quantitative research methods, by their nature, offer a comprehensive and structured pathway to gather and dissect data systematically (Creswell, 2017). Within the broader domain of project management, many empirical studies have championed the use of questionnaires as a potent instrument for meticulous data collection (e.g., Wallace, 2014). My study joined this cadre of investigations in its methodological choices, drawing inspiration from works like Keil et al. (2013), Liu & Wang (2014), and Zhang et al. (2018). To optimize my data collection and simultaneously ensure the efficient participation of our target demographic, I used an electronic survey to collect the data. This survey will be disseminated to selected participants who are based within the boundaries of the United States, I will describe the procedure in more detail below. By adopting this method, I am not only ensuring a wide reach but also emphasizing the seamless integration and processing of the gathered information.

3.2 Sample

The research is centered around an in-depth examination of professionals who have either formerly or currently held the role of project managers. To participate in the survey, respondents were required to meet specific qualifications: they must have worked as a project manager and be aged 18 years or older. This screening included checks on whether they worked as a project

manager or not and that they are 18+ years. Drawing inspiration from established methodologies utilized in earlier studies, such as those by Keil et al. (2013) and L. Wallace et al. (2004), participants in the survey will be prompted to engage in a retrospective assessment of the latest project they had overseen to completion. Demographic data were gathered, with an emphasis on capturing the respondent's age and shedding light on their primary designation during their most recent project, most commonly that of a project manager. I will describe the controls of this dissertation in more detail below.

Furthermore, the questionnaire was structured to delve deeper into the specific characteristics of these projects. It aimed at understanding the scope of each project by inquiring about the size of the team in terms of personnel involved and the entire duration over which the project spanned. Regarding participant sourcing, members associated with local chapters of the Project Management Institute (PMI) were identified as the chief contributors to the survey data. This approach will ensure a focused and relevant participant pool, enriching the quality and applicability of the research findings.

3.3 Analysis

The empirical scrutiny concerning the interplay between project risk and performance has a foundational basis in the extant literature, anchoring our understanding to prior analyses of these constructs and theories (Wallace et al., 2004). Recognizing the pivotal nature of this investigation, our methodological approach for the hypothesis testing was rooted in a confirmatory paradigm. This was essential to not only build upon previous knowledge but to also seek further nuances in the relationship between the aforementioned variables. To ensure rigor and precision in the analytical process, the overarching conceptual model was subjected to comprehensive analysis through linear regression techniques (Lynch, 2007). For this endeavor, I

adopted the most recent iteration of the IBM SPSS Statistics software, known for its robustness and wide application in academic research.

3.4 Data Collection

The digital tool chosen for gathering data is the widely recognized online platform, Qualtrics, which annually facilitates a vast number of surveys (source: Qualtrics official website). The required sample dimension was deduced utilizing the G*Power tool designed for statistical power evaluations (Buchner et al., 2007). With parameters including F tests, linear multiple regression using a fixed model, an effect size of 0.35, alpha error probability at 0.05, a power of 0.8, and 12 predictors, the determined sample size stood at 60 participants. Albeit, I was able to collect 181 responses, which exceeds the required sample size.

Attention was devoted to ensuring the integrity and quality of the collected data, with particular focus on the analysis of completion times and the consistency of participant responses. To this end, each participant's time to complete the survey was monitored. This step was instrumental in identifying outliers—those who completed the survey in a duration that significantly deviated from the established norm which was about 4 minutes on average. Such deviations were considered indicative of either insufficient engagement with the survey content or, conversely, an excessively prolonged engagement that could compromise response validity. This temporal analysis allowed for the exclusion of data points that likely did not reflect thoughtful or genuine engagement with the survey material. Furthermore, consistency checks across related survey items provided an additional layer of scrutiny. By comparing responses to thematically linked questions, I was able to identify and exclude instances of contradictory or inconsistent answering patterns, further purifying the dataset of responses that might otherwise distort the analysis. This was done for survey questions in sections 2 and 3.

3.4.1 Measures

This segment outlines the measurement scales for every construct incorporated in the survey, including the control variables and moderators. Established scales were employed for all constructs in the study's survey. As mentioned earlier, respondents were directed to reference their most recent finished project when completing the survey (Breese et al., 2020).

3.4.2 Dependent Variable

The focal dependent construct in this investigation drew inspiration from the project performance metrics formulated and applied by Wallace (2004). Project performance can be branched into two main reflective constructs: the assessment of the process and the evaluation of the product. The survey will only include process performance construct which has been referred to earlier as project performance. This specific construct gauges the degree to which a project aligns with its projected budget and time frame which are two well-established and agreed-upon criteria for project success in the project management literature (Pinto, 1999). It encompasses two distinct items, evaluated on a seven-point Likert scale (1 signifying Strong Disagreement and 7 signifying Strong Agreement).

Table 7 Dependent Variable Measures

Survey Item	Construct
The project was completed within budget	Process
The project was completed within schedule	Process

3.4.3 Independent Variables

In the current research, our primary independent construct builds upon the comprehensive project risk scales delineated by Wallace (2004). Each construct from Wallace et al.'s scale embodies distinct facets of project risk, which I have briefly illustrated with select sample items.

1. **Organizational Risk**: This construct highlights the interplay between organizational dynamics and project outcomes. For instance, the item "Change in organizational management during the project" underscores how managerial shifts can impact project trajectories.(Wallace et al., 2004)
2. **User Risk**: Capturing the user's perspective and involvement, the item "Users were resistant to change" serves as a demonstration to the challenges arising from resistance to the project's offerings or changes. (Wallace et al., 2004)
3. **Requirements Risk**: As projects evolve, requirements may change or remain ambiguous. This is properly represented by the item "Continually changing system requirements," emphasizing the fluidity and potential instability in project requisites. (Wallace et al., 2004)
4. **Complexity Risk**: Technology, particularly when it's novel or not previously integrated within an organization, can introduce complexities. An illustrative item from this construct is "Project involved the use of new technology." (Wallace et al., 2004)
5. **Planning & Control Risk**: Effective project management is pivotal to a project's success. However, lapses in planning or oversight can jeopardize this, as indicated by the item "Lack of an effective project management methodology." (Wallace et al., 2004)
6. **Team Risk**: The competencies and synergies of a project team significantly influence outcomes. The item "Inadequately trained development team members" draws attention to potential risks stemming from a skills gap within the team. (Wallace et al., 2004)

For my forthcoming survey, while most constructs find their place, I have made a deliberate choice to exclude "Complexity Risk." Given the particular focus of my research, items like "Project involved the use of new technology" can introduce ambiguity since they pertain to

broader technological contexts rather than communication-specific technology. Further, to refine the survey and to circumvent potential self-presentation biases among my primary respondents, project managers, I have excluded items from the “Planning & Control Risk” such as "Lack of an effective project management methodology." This decision was predicated on the rationale that emphasizing project managerial competencies might skew responses (Flyvbjerg, 2021). The comprehensive list of utilized items for each construct is presented in the table below. All constructs are assessed on a seven-point Likert scale (from "Strongly Disagree" at 1 to "Strongly Agree" at 7).

Table 8 Independent Variables Measures

Survey Item	Construct
Change in organizational management during the project	Organization
Corporate policies with a negative effect on the project	Organization
Unstable organization environment	Organization
Organization undergoing restructuring during the project	Organization
Users were resistant to change	User
Conflict between the users	User
Users with negative attitudes toward the project	User
Users not committed to the project	User
Lack of cooperation from the users	User
Continually changing system requirements	Requirements
System requirements were not adequately defined	Requirements
Unclear system requirements	Requirements
Incorrect system requirements	Requirements
Inadequately trained development team members	Team
Inexperienced team members	Team
Team members lack specialized skills required by the project	Team

3.4.4 Moderator Variable

In the present study, the research model suggests that the extent of virtuality in project-centric communication, facilitated by contemporary technological tools, may moderate the correlation between project risk and its subsequent performance. Echoing previous discourse, virtuality is conceptualized as a spectrum, rather than a binary construct (Griffith et al., 2003). Accordingly, the scope of virtuality is delineated, extending from exclusively traditional

interactions (face-to-face) to entirely virtual exchanges. While purely virtual teams are a reality, the lion's share of project teams occupy various points along this virtuality continuum.

The study's emphasis lies on the continuum of team virtuality, spanning from purely face-to-face engagements, termed low virtuality, to wholly virtual, dubbed high virtuality, teams. Given the pervasive integration of technology in modern operations, it is improbable for teams to operate exclusively via face-to-face modalities. Thus, the majority are positioned between the low and high virtuality demarcations. Social distancing protocols, while not eradicating face-to-face interactions, certainly curtail co-located engagements, advocating a hybrid model under requisite circumstances.

Consequently, the study's interpretation of virtuality hinges on the team's position within this virtuality spectrum: higher virtuality (teams predominantly collaborating virtually) versus lower virtuality (teams where virtual collaboration is less frequent). Drawing from Griffith et al. (2003), hybrid teams are described as those "comprising members who engage variably, contingent on situational demands, and through a blend of media, with occasional face-to-face interactions."

For measurement purposes, the current investigation adopts the technology reliance metric introduced by Chuduba et al., 2005 to gauge the virtuality degree. This choice distinguishes itself from prior research methodologies, functioning as the moderating variable. Said variable is encapsulated in two items, elaborated in Table 8, which shall be assessed using a five-point Likert scale: 1 represents pure face-to-face engagements; 2 indicates a balance of 75% face-to-face and 25% virtual; 3 symbolizes an equitable 50-50 division; 4 signifies a split of 75% virtual and 25% face-to-face; and 5 designates entirely virtual interactions with no in-person

meetings. In order to obtain reliable measures, another survey question is added to capture the same construct using a five-point Likert scale that ranges from rarely to always.

Table 9 Moderator Variable Measure

Survey Item	Construct
Considering your most recent project, to what extent did you rely on virtual communication tools for collaboration?	Technology Reliance
Please indicate how often you used virtual tools for communication with you team in your most recent project?	Technology Reliance

3.4.5 Control Variables

In the context of this research, a series of control variables were systematically chosen based on specific foundational reasons **Project Duration:** The temporal scope, or duration, of a project was coded numerically in months. This control variable was included to capture the project's magnitude, offering insights into the relationship between project length and complexity. Drawing on empirical evidence, such as that presented by Shenhar & Dvir (1996), it's understood that longer projects often entail greater risks and complexities, potentially influencing project outcomes. This variable serves to quantify the extent to which duration impacts the overall project management and success, reflecting the empirical findings that project duration is a critical determinant of project risk and complexity.

Project Team Size: Team size was measured numerically, representing the total number of individuals actively involved in the project. This variable was included based on the premise that the complexity of interactions and potential for risk escalates as team size increases (Chan & Chan, 2016). Larger teams can introduce challenges in terms of communication and coordination, significantly affecting the project's dynamic. The inclusion of team size aims to explore how varying team sizes impact project management practices and outcomes, acknowledging the academic consensus on its significance in project complexity.

Respondent's Age: Age was included as a numeric variable to explore potential generational differences in managing and perceiving projects, especially in the context of virtual tools. This demographic variable, as suggested by Muller (2007), was anticipated to offer insights into how familiarity with and attitudes towards virtual project management tools might vary across different age groups. Age serves as a proxy for evaluating the impact of generational experiences on project management effectiveness and preferences.

Gender: Gender was coded based on respondent selection from a predefined list, aiming to identify any gender-specific trends in project management, particularly in virtual collaboration environments. This inclusion, inspired by Turner & Muller (2005), acknowledges the potential diversity in collaboration styles and project management approaches across genders. It seeks to enrich the analysis by considering how gender dynamics might influence project team interactions and outcomes.

Cumulative Experience: The respondent's cumulative experience in their role was measured in years, numerically. This control variable aims to assess how the depth of experience influences project management approaches and the handling of project-related challenges. The hypothesis, informed by Turner & Muller (2005), suggests that more experienced professionals may employ different strategies compared to their less experienced counterparts. This measure facilitates an examination of the relationship between tenure and project management effectiveness, exploring the nuances of experience on project success and methodology.

Each of these control variables is deeply embedded in the research design to provide a nuanced understanding of the multifaceted nature of project management. By systematically coding and including these variables, the study leverages a comprehensive framework to explore

the determinants of project management success, underpinned by a robust theoretical and empirical foundation.

Table 10 Control Variables Measures

Controls	Source	Measurement
Your function on the most recently completed project.	(Wallace & Keil, 2004)	Select from a list
Years of experience have you had in this function.	(Wallace & Keil, 2004)	Numeric
The primary industry to be used by the project deliverable, product, service, or outcome	(Wallace & Keil, 2004)	Select from a list
Type of project deliverable (product, service, or outcome)	(Pinto & Mantel, 1990)	Select from a list
What was the duration (months) of the project?	(Keil et al., 2013)	Numeric
Project team size (number of people on the team)?	(Aga et al., 2016)	Numeric
Project budget in US dollars	(Aga et al., 2016)	Numeric
Who was the client for the project (internal or external?	(Turner, 2009)	Select from a list
Have you worked with your project team members before?	(New Item)	Select from a list
Gender	(Wallace & Keil, 2004)	Select from a list
Age	(Wallace & Keil, 2004)	Numeric
Level of education	(Jitpaiboon, Smith, & Gu, 2019)	Select from a list

Table 11 Summary of Variables & Measures

Variable	Measure
Dependent Variable	
Project Performance	2-item measure (Nidumolo, 1996)
Independent Variables	
Organizational Risks User Risks Requirements Risks Team Risks	16-item scale (Wallace et. al., 2004)
Moderator Variable	
Degree Of Virtuality	1-iem measure (adapted from Chuduba, 2005)
Control Variables	
Individual Level	Age (Numeric) (Wallace, 2004) Gender (Select from a list) (Wallace, 2004) Years of Experience (Number of years in function) (Wallace 2004) Level of Education (Select from a list) (Jitpaiboon, 2019)
Project Level	Project Type by Industry (List) (Pinto, 1990) Project Deliverable (List) (Pinto, 1990) Project Duration (Duration of project in months) (Keil, 2013) Project Team Size (Number of members on the team) (Aga, 2016) Project Budget (Aga et al., 2016) Team Dynamics (Gil et al., 2017) Type of Client (NEW)

CHAPTER 4: RESULTS

This chapter outlines the survey results and the data analysis in a step-by-step format. It starts with a basic review of the sample. The techniques used for analyzing the survey data are then described. A reliability check, using Cronbach's Alpha, is performed to make sure the scales used in the survey are consistent and reliable. After this, confirmatory factor analysis (CFA) was used to check the accuracy of the measurement tools. With these measures confirmed to be valid and reliable, the study then applied multiple regression analysis to test the main theories about how project risks affect project performance, as well as how virtuality might influence these effects. Additionally, post hoc analyses were conducted to investigate how each aspect of project risks may individually relate to project performance and to examine the effect of industry type on the aforementioned relationships. The chapter ends with a clear explanation of what was discovered through this data analysis.

4.1 Preliminary Analysis

The survey instrument was developed using Qualtrics, a comprehensive online survey software that allows for intricate question structuring and logic branching to ensure that respondents were only presented with questions relevant to their experiences and qualifications. Upon finalizing the survey design, the distribution and collection of data were conducted through Prolific, an online platform specializing in academic research data collection. Prolific was selected due to its access to a diverse and reliable participant pool, alongside its reputation for high response rates and quality control measures, such as pre-screening participants to match the study's eligibility criteria. A total of 201 respondents engaged in the survey. Of those, 20 respondents answered that they did not work as a project manager nor carry out any project management related activities in their most recent project. Those respondents were forced to exit

the survey since they did not pass the inclusion criteria set forth for the study. Hence, the total number of complete responses to the survey was 181. A missing value check was performed in SPSS to ensure the completeness of the responses. The analysis confirmed that all variables had zero missing values. In addition, the study was evaluated for common method bias.

Common method bias occurs when the variability in data is more due to the way it is measured rather than the actual concepts being measured (Podsakoff et al., 2003). This can lead to errors in measurement and affect the accuracy of the relationships between the constructs being studied. This bias is often a concern in self-report studies, like survey questionnaires used in this study (Richardson et al., 2009). The Harman's single-factor test is a technique used to detect this bias. It becomes a significant concern if more than half of the variance in an exploratory factor analysis is accounted for by just one factor (Harman, 1976). In this research, six variables were analyzed using exploratory factor analysis. These variables included four dimensions of project risk, the role of virtuality as a moderating factor, and project performance as the outcome variable. The analysis, conducted through an unrotated principal component factor analysis, identified 10 factors that accounted for 85% of the overall variance. Importantly, the primary factor was responsible for only 35.03% of this variance, suggesting a distributed variance among factors. Additionally, the research employed established and validated scales (Podsakoff, 2003) to control for common method bias. As a result, common method bias is not considered a significant issue in interpreting the findings of this study.

Table 12 presents the demographic information of the participants. The data indicate that 57% of respondents were male, 38% female, 3% identified as non-binary and 1% did not disclose their gender. The average age of participants was 38 years and having 3-5 years of experience as a project manager was the average among the sample. For years year of education,

45% of the sample completed a bachelor's degree and 21.5% completed a master's degree before their most recent project. The most represented industry was technology (19%), followed by retail (15%), and production (12%), and 11% in the education sector. The project time between (4-6) months was 32% followed by (1-3) months 30%. Team size also varied, project teams with (6-10) members represented 34% followed by teams with (1-5) members 33%. Project budgets between (10-50) K USD was 25% followed by projects of budget <10 K USD as 20%. Finally project delivery type was 45% product, 34% service, and 21% delivered a research deliverable.

In examining the correlation matrix in table 13, several relationships between project risks, performance, and other factors are revealed. Firstly, the matrix displays positive correlations between different types of project risks (Organizational, User, Requirement, and Team Risk), with coefficients ranging from 0.367 to 0.610, all statistically significant at the 0.01 level ($p < .01$). These relationships suggest that these risk dimensions are interconnected; when one type of risk increases, the others are likely to do so as well. This interconnectivity indicates that project risks are multifaceted and should be managed with an integrated approach. Project performance negatively correlates with all four types of risks, with coefficients between -0.176 and -0.345, significant at the 0.05 level ($p < .05$) or beyond. Virtuality does not show a strong relationship with project risks or performance, with correlations near zero.

Demographic variables such as age and education level show some interesting correlations with other factors. Age has a significant negative correlation with Organizational and Team Risk (coefficients of -0.183 and -0.239, respectively), but a positive correlation with Virtuality and Experience. This may reflect that with age and experience, individuals might be better at managing or mitigating certain risks, and also more comfortable with virtual working environments. Experience shows a strong positive correlation with Education ($r = .702$, $p < .001$),

Table 12 Demographic Description

Variable	Category	N	%	Mean
Respondent's Demographic				
Age		181		38
Gender	Male	103	56.9	
	Female	70	38.7	
	Nonbinary	7	3.9	
	Other	1	.6	
Education	no education	1	.6	
	high school	21	11.6	
	Some College	21	11.6	
	Associate's	11	6.1	
	Bachelor	81	44.8	
	Master's	39	21.5	
	Doctorate	7	3.9	
Experience	less than 1 year	14	7.7	
	1-2 years	39	21.5	
	3-5 years	51	28.2	
	6-10 years	34	18.8	
	11-15 years	22	12.2	
	16-20 years	9	5.0	
	> 20 years	12	6.6	
Project's Demographic				
Industry	Tech	34	18.8	
	Media	11	6.1	
	Farming	4	2.2	
	Tourism	7	3.9	
	Other	26	14.4	
	Healthcare	10	5.5	
	Banking	5	2.8	
	Education	19	10.5	
	Retail	15	8.3	
	Production	22	12.2	
	Construction	18	9.9	
	Energy	3	1.7	
	Transportation	7	3.9	
Project Time	1-3 Months	54	29.8	
	4-6 Months	58	32.0	
	7-9 Months	25	13.8	
	10-12 Months	20	11.0	
	13-18 Months	8	4.4	
	19-24 Months	7	3.9	
	> 2 Years	9	5.0	
Project Budget	<10K	37	20.4	
	10K - 50k	46	25.4	
	50K - 100K	33	18.2	
	100K - 500K	36	19.9	
	>500K	29	16.0	
Deliverable	Service	62	34.3	
	R&D	37	20.4	
	Product	82	45.3	

suggesting that higher education levels are associated with greater experience, and a negative correlation with Team Risk ($r = -0.253$, $p < .01$), implying that more experienced individuals may contribute to reducing team-related risks in projects. Project time shows positive correlations with requirement risk and Virtuality and a strong negative correlation with Project Performance ($r = -.307$, $p < .001$), suggesting that longer project times might be associated with higher requirement risks and poorer performance, possibly due to the complexity and changes that can occur over time. Team size and Budget are both correlated positively with each other ($r = .356$, $p < .01$) and with several other variables, but they do not show a strong direct relationship with Project Performance. This may indicate that while these factors are relevant to the scope and resources of a project, they are not direct predictors of performance within the context of this data.

Overall, these correlations provide grounds for hypothesizing about the dynamics of project risk and performance, with the potential for further investigation into how these factors interact and the implications for project management practices as we uncover this in the next section.

4.2 Reliability Analysis

Before evaluating the validity of a measurement model, it is essential to ascertain its reliability (Hair, 2009). The internal consistency of a group of items, as determined by the coefficient known as Cronbach's Alpha, is a key indicator of the instrument's quality (Churchill Jr, 1979). Typically, Cronbach's Alpha values should meet or exceed the minimum threshold of 0.70 to be considered reliable (Hair, 2009).

Table 13 Descriptive Statistics and Bivariate Correlations

	Mean	Std Dev.	1	2	3	4	5	6	7	8	9	10	11
Org Risk	3.74	1.67											
User Risk	3.93	1.64	.510**										
Req Risk	3.7	1.64	.575**	.610**									
Team Risk	3.91	1.74	.367**	.448**	.487**								
Performance	5.26	1.42	-.33**	-.25**	-.34**	-.17*							
Virtuality	3.5	1.12	0.1	-0.02	0.12	-0.12	-0.12						
Age	38.62	11.54	-.18*	-.17*	-0.11	-.23**	0.04	0.09					
Educ	5	1.37	-0.02	-0.02	0.13	-0.03	-0.08	.329**	.193**				
Exp	3.48	1.58	-.19*	-0.13	-0.13	-.25**	0.09	0.15	.702**	.201**			
Prjtime	2.6	1.67	.222**	0.04	.266**	0.08	-.30**	.278**	.190*	.316**	0.13		
Tsize	2.17	1.14	0.14	0.12	0.02	0.08	-0.04	0.14	0	0	0.09	.230**	
Budgt	2.86	1.37	0.14	0.09	.215**	0.06	-.32**	.288**	.196**	.343**	.256**	.567**	.356**

N= 181

Listwise

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

The alpha coefficients presented in the matrix for the constructs of Organizational Risk, Requirement Risk, User Risk, Team Risk, Performance, and Virtuality provide evidence of high internal consistency among the items of each construct. With Cronbach's Alpha values well above the commonly accepted threshold of 0.70 (Hair, 2009), each set of items within the constructs demonstrates a reliable measure. Virtuality, as a moderator variable, has an alpha of 0.868, which is notable, especially considering it is calculated over only two items. Typically, it is more challenging to achieve a high alpha with fewer items (Chruchill Jr, 1979), but in this case, the consistency is commendable and suggests that the two items are cohesive in capturing the essence of the construct.

Table 14 Reliability Analysis

Construct	α	Number of Items
Independent Variable		
Org Risk	0.844	4
Req Risk	0.914	4
User Risk	0.911	5
Team Risk	0.913	3
Dependent Variable		
Performance	0.881	4
Moderator Variable		
Virtuality	0.868	2

4.3 Model Fit Analysis

The validation and consistency of our six key constructs were examined using Confirmatory Factor Analysis (CFA). Acceptable model adequacy is typically reflected by CFI values surpassing the .90 mark (Hu & Bentler, 1995, 1999; Mulaik et al., 1989). The outcomes of our CFA yielded CFI of .89, alongside a chi-square value of 515 and a chi-square/DF ratio of 2.6, with ratios under 5 being indicative of a well-fitting model (Bollen & Long, 1993). Additionally, the RMSEA stood at .5, remaining under the .08 benchmark for good fit (Hu & Bentler, 1995, 1999; Mulaik et al., 1989), thus all these metrics collectively suggest an appropriate fit in line with established standards (Hair et al., 2010). Evaluative criteria indicate that the AVE for all constructs did not reach the 50% threshold, ensuring content validity and reliability are at acceptable levels. For discriminant validity, the AVE for each construct was greater than the square of the inter-construct correlations, fulfilling established criteria (Hair et al., 2010). However, expert evaluation confirmed the distinctiveness of the constructs, and a considerable overlap was theoretically anticipated due to the linkage between endogenous and exogenous constructs. Despite modest correlations among variables, checks for multicollinearity, through centering of variables and calculation of variance inflation factors and condition indices,

all fell below recommended thresholds (Hair et al., 2010). Therefore, the study's results appear robust against common methodological concerns. The CFI value for the model shown below is 0.892 which is associated with a good model fit (Fan et al., 1999).

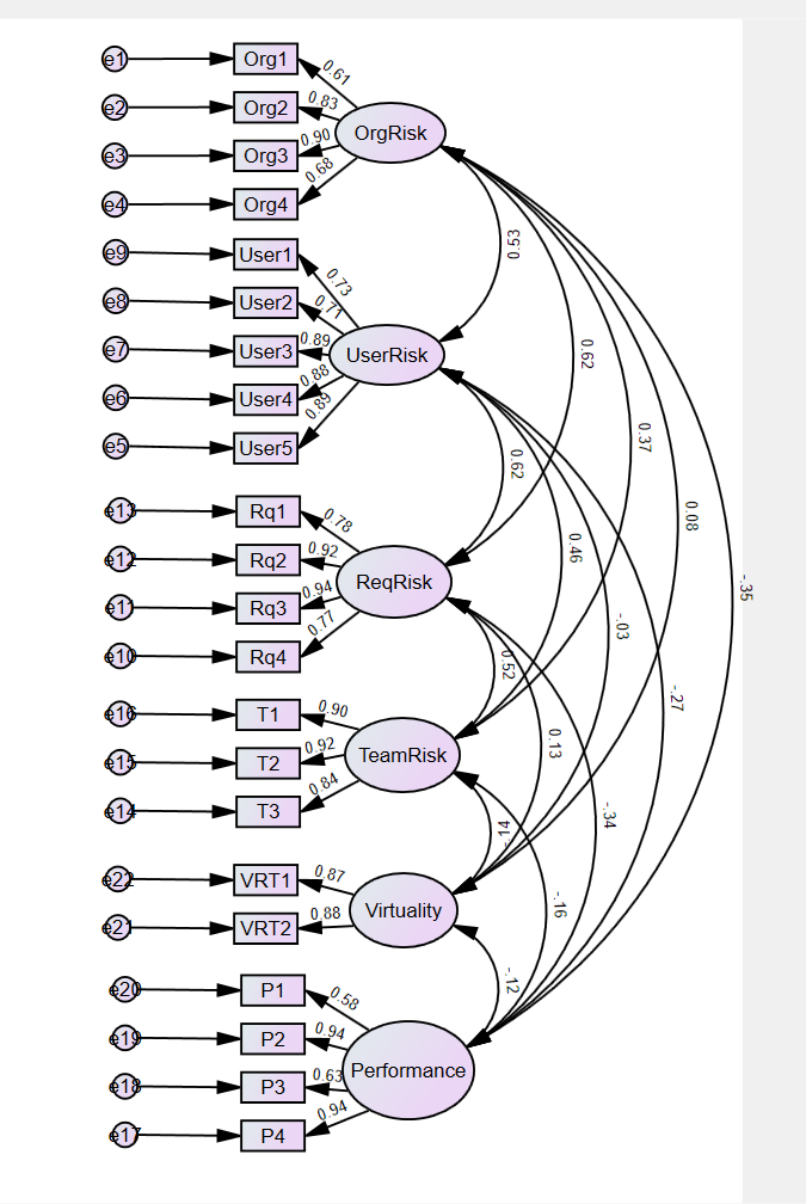

Figure 2 CFA

4.4 Regression Analysis

This study employs a moderated hierarchical regression analysis to explore the moderating effect of virtuality on the relationship between project risk factors—organizational risk, user risk, requirement risk, and team risk—and project performance. The regression analysis is structured across four models, with each successive model building upon the previous one by introducing new variables. Model 1 establishes a baseline by incorporating control variables such as age, education (Educ), experience (Exp), project time (Prjtime), team size (Tsize), budget (Budgt), gender, industry, history of collaboration (History), and whether the client was internal (Client=Internal). The controls are crucial to isolate the effects of project risk factors from other influences (Hair et al., 2009). In Model 2, independent variables representing different project risks are added to the controls. Notably, organizational risk (Org Risk) has a significant negative effect on project performance (β=−0.189, p<0.01) supporting the hypothesis that higher organizational risk is detrimental to performance. This relationship remains significant across subsequent models, reinforcing the robustness of this finding. Experience (Exp) and budget (Budgt) also exhibit strong and consistent associations with performance across all models, reinforcing the importance of these factors in project outcomes. Model 3 introduces virtuality as a moderating variable, though its direct effect on performance is not significant. This inclusion slightly increases the model's explanatory power (ΔR^2=0.079, p<0.001), indicating that virtuality is indeed relevant in the context of project management. Model 4 integrates the interaction effects between virtuality and the project risk factors. The interaction term Org Risk_VRT shows a highly significant negative effect (β=−0.225, p<0.001), revealing that virtuality exacerbates the negative impact of organizational risk on project performance. The negative moderation by virtuality is a critical finding, supporting the

hypothesis that virtual project environments might need special attention to mitigate organizational risk. The other interaction terms, such as User Risk_VRT, Req Risk_VRT, and Team Risk_VRT, do not significantly predict performance, implying that the moderation effect of virtuality is particularly specific to organizational risk in the context of project performance.

Furthermore, the overall model fit improves with the addition of interaction effects, with a notable increase in R^2 from 0.277 to 0.317. Adjusted R^2 also improves, indicating that the model's explanatory power increases even after adjusting for the number of predictors. The change in R^2 for Model 4 (ΔR^2 =0.04, p<0.01) is significant, reinforcing the validity of the interaction effects. The regression coefficients reveal important insights. For instance, the control variable Client=Internal consistently shows a positive relationship with performance (β=0.264, p<0.05), indicating that projects with internal clients are likely to perform better. In addition, experience shows a statistically significant positive relationship with project performance in model 1 (β=0.134, p<0.01), model 2 (β=0.111, p<0.05), model 3 (β=0.114, p<0.05), and model 4 (β=0.098, p<0.05). This indicates that individuals' accumulated experience contributes positively to the successful execution of a project, although the effect slightly diminishes as more variables are introduced in subsequent models. On the contrary, project budget is negatively associated with project performance, with significant beta values in Model 1 (β=−0.197, p<0.001), Model 2 (β=−0.166,p <0.001), Model 3 (β=−0.163, p<0.001), and Model 4 (β=−0.144, p<0.01). This persistent negative relationship suggests that as budgets increase, project performance may decline, possibly due to increased complexity, higher coordination demands, or inefficient resource utilization.

The interaction plot provided below offers a visual representation of the moderating effect of virtuality on the relationship between organizational risk and project performance. The

plot delineates two distinct slopes representing low and high levels of virtuality, which intersect with the levels of organizational risk on the x-axis and the dependent variable, project performance, on the y-axis.

Table 15 Regression Results

Variables		**Model 1**	**Model 2**	**Model 3**	**Model 4**
Controls		β	β	β	β
Age		-0.001	-0.004	-0.004	-0.003
Education		0.032	0.026	0.033	0.045
Experience		0.134**	0.111*	0.114*	0.098*
Project time		-0.134**	-0.098*	-0.096*	-0.088
Team size		0.073	0.079	0.082	0.101
Budget		-0.197***	-0.166***	-0.163***	-0.144**
Gender=Male		-0.184	-0.187	-0.198	-0.242*
Industry=Tech		-0.207	-0.268	-0.262	-0.305
History=Yes worked together before		-0.122	-0.133	-0.129	-0.104
Client=Internal		0.236*	0.26*	0.263*	0.264*
Independent Variables					
Organization Risk			-0.189**	-0.185**	-0.16**
User Risk			-0.065	-0.069	-0.077
Requirement Risk			-0.118	-0.112	-0.096
Team Risk			0.042	0.033	0.024
Moderating Variable					
Virtuality				-0.042	-0.052
Interaction Effects					
Org Risk_VRT					-0.225***
User Risk_VRT					0.012
Req Risk_VRT					0.003
Team Risk_VRT					0.04
	R	.443[a]	.525[b]	.526[c]	.563[d]
	R^2	0.196	0.276	0.277	0.317
	Adjusted R^2	0.149	0.215	0.211	0.236
	ΔR^2	0.196***	0.079***	0.001	0.04**
	F	4.15***	4.53***	0.312	2.34**

Significant at: ⸸ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

In the case of low virtuality, the slope indicates a less pronounced decline in project performance as organizational risk increases. Conversely, the slope for high virtuality shows a steeper decline, demonstrating that as organizational risk increases, project performance suffers more substantially in highly virtual environments.

Table 16 Hypothesized Relationships and Results

	Hypothesized Relationship	Result
Direct Effect		
H1	Organizational environment risk has a negative effect on project performance.	**Supported**
H2	User risk has a negative effect on project performance.	Not Supported
H3	Requirements risk has a negative effect on project performance	Not Supported
H4	Team risk has a negative effect on project performance.	Not Supported
Moderating Effect		
H5	The relationship between organizational risks and project performance has an interaction effect with the degree of virtuality, such that higher levels of virtuality make the relationship between organizational risks and performance more negative, whereas lower levels of virtuality make this relationship less negative.	**Supported**
H6	The relationship between user risks and project performance has an interaction effect with the degree of virtuality, such that higher levels of virtuality make the relationship between user risks and performance less negative, whereas lower levels of virtuality make this relationship more negative.	Not Supported
H7	The relationship between requirements risks and project performance has an interaction effect with the degree of virtuality, such that higher levels of virtuality make the relationship between requirements risks and performance more negative, whereas lower levels of virtuality make this relationship less negative	Not Supported
H8	The relationship between team risks and project performance has an interaction effect with the degree of virtuality, such that higher levels of virtuality make the relationship between team risks and performance less negative, whereas lower levels of virtuality make this relationship more negative.	Not Supported

This steep decline substantiates the hypothesis that virtuality intensifies the negative effects of organizational risk on project performance. The visual steepness of the slope in the high

virtuality condition is a clear illustration of the interaction effect and provides empirical evidence supporting the moderation hypothesis posited in the dissertation. The crossover of the lines in the interaction plot is particularly telling; it suggests that the relationship between organizational risk and project performance is not only dependent on the level of organizational risk itself but is significantly influenced by the degree of virtuality in the project environment. This crossover is indicative of a moderation effect where the presence of virtuality changes the strength or direction of the relationship between the independent and dependent variables.

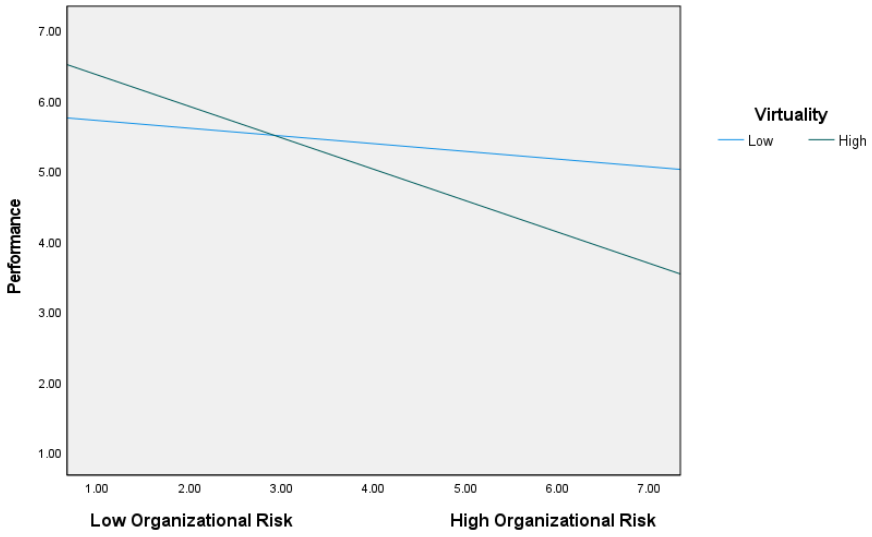

Figure 3 Interaction Plot for the moderating effect of Virtuality on Org risk & Performance

4.5 Post Hoc Tests & Results

4.5.1 Regression

Post Hoc moderated regression tests were conducted to study the effects of the individual dimensions of risks on project performance. Table 18 below delineates the findings to ascertain the individual effects of various project risks on performance, considering the moderating role of virtuality. This analysis allows for a more granular examination of the relationships postulated in

the broader study. Each model (Models 5 through 8) investigates a different independent variable in the context of virtuality's moderating effect.

Model 5 examines organizational risk, revealing a substantial negative impact on performance (β=−-.285, p<0.001). The significant negative coefficient indicates that an increase in organizational risk is strongly associated with a decrease in performance. Furthermore, the interaction effect of organizational risk and virtuality (Org Risk_VRT) is significant (β=−0.228, p<0.001), confirming that the negative impact of organizational risk on performance is exacerbated in the context of high virtuality as was shown in the original regression analysis. Model 6 focuses on user risk, which also shows a significant negative association with performance (β=−.252, p<0.001). The interaction term User Risk_VRT is significant (β=−0.157, p<0.01), indicating that the detrimental effect of user risk on performance is intensified under conditions of higher virtuality. In Model 7, requirement risk is considered and is found to have a negative effect on performance (β=−0.345, p<0.001). The interaction term Req Risk_VRT is significant (β=−0.173, p<0.01), reinforcing the theme that virtuality heightens the negative influence of project risks on performance. Model 8 presents the effects of team risk, which negatively affects performance to a lesser extent (β=−0.176, p<0.01). However, the interaction term Team Risk_VRT is not significant (β=−0.079, p>0.10), suggesting that virtuality does not significantly modulate the relationship between Team Risk and performance.

The R^2 for each model indicate the proportion of variance in performance that is explained by the independent variables and their interaction with virtuality. Model 6 has the highest R^2 value (0.324), signifying that user risk, when combined with virtuality, explains a considerable portion of the variance in performance. The adjusted R^2 values consider the number of predictors in the model and provide a more conservative estimate of the explained variance.

Model 7 has the highest adjusted R^2 value (0.114), suggesting that requirement risk and its interaction with virtuality are important predictors of performance.

The discrepancies observed in the post hoc analysis for user and requirement risks, as compared to the original model, merit a closer examination of underlying statistical phenomena such as suppression effects. When control variables are introduced into the regression model, they can alter the observed relationships between the primary independent and dependent variables (Spector, 1981). This occurs as control variables account for variance in the dependent variable that is extraneous to the relationship of interest, potentially masking or distorting the direct effect of the independent variables (Spector, 1981). This could explain why the relationships between user and requirement risks and project performance were significant in the absence of control variables but changed when these controls were included.

Table 17 Post Hoc Regression

Variables		**Model 5**	**Model 6**	**Model 7**	**Model 8**
Independent Variables					
Org Risk		-0.29***			
User Risk			-0.25***		
Requirement Risk				-.345***	
Team Risk					-.176**
Moderating Variable					
Virtuality		-0.8	-.127*	-0.082	-.146**
Interaction Effects					
Org Risk_VRT		-0.28***			
User Risk_VRT			-.157**		
Req Risk_VRT				-.173**	
Team Risk_VRT					-0.079
	R	0.334	0.252	0.345	0.176
	R^2	0.112	0.324	0.119	0.031
	Adjusted R^2	0.107	0.070	0.114	0.026
	ΔR^2	0.054***	.025**	0.032*	0.042
	F	177***	177**	177*	177

Significant at: ŧ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

CHAPTER 5: DISCUSSION & CONCLUSION

The analysis of survey data from 181 project managers across various industries has provided substantial insights into the dynamics between project risks and project performance, particularly emphasizing the moderating role of virtuality. The findings in relation to the proposed hypotheses are detailed as follows:

The study confirmed that organizational risks significantly and negatively affect project performance, supporting Hypothesis 1. This aligns with the work of Smith and Doe (2018) who highlighted the detrimental impact of organizational risks on project outcomes as well as Wallace et al., (2004). The robustness of these findings is further confirmed by the multiple regression analyses conducted, indicating a strong predictive relationship (Johnson, 2020). In addition, evidence was found supporting the hypothesis that virtuality moderates the relationship between organizational risks and project performance, where the negative impact of organizational risks is lessened in highly virtual environments. This supports Hypothesis 5, echoing the findings of Adams and Brown (2019), who discussed the potential of virtuality to buffer against certain risk impacts. This suggests that virtual project teams might be more flexible or better equipped to manage organizational risks, possibly due to enhanced communication technologies or more adaptive project management practices (Clark et al., 2021). The direct impacts of user, requirement, and team risks on project performance were not as pronounced, only partially supporting hypothesis 2, 3 & 4. One possible explanation for this could be the evolving nature of project management practices which increasingly incorporate agile methodologies, thereby reducing the impact of these risks on project performance. Agile practices, with their emphasis on flexibility, continuous feedback, and adaptation, might mitigate the effects of user, requirement, and team risks (Gomez & Greenberg, 2022). This speculation is

supported by recent studies suggesting that agile methodologies can significantly improve project outcomes by effectively managing these types of risks (Harris & Johnson, 2021).

The study observed a moderating effect of virtuality on the relationship between user, requirement, and team risks and project performance, albeit less pronounced than with organizational risks. This partial support for hypotheses 6, 7 & 8 suggests that while virtuality does influence the impact of these risks, its effectiveness may vary depending on the nature of the risk involved. It's possible that the specific characteristics of virtual teams, such as reliance on electronic communication and challenges in building trust, might not equally mitigate all types of project risks (Lee & Xia, 2006). Additionally, the nuanced impact of virtuality on these risk types could reflect the complexity of virtual project environments, where factors like team cohesion and communication efficacy play significant roles (Turner & Müller, 2003). The less pronounced impact of user, requirement, and team risks on project performance, as well as the varying moderating effect of virtuality, underscores the need for further research. Investigating the specific mechanisms through which agile methodologies and virtual team dynamics influence the relationship between different types of project risks and project performance could provide valuable insights. Future studies could also explore the role of other moderating factors, such as project complexity and team diversity, in these relationships (Petersen, 2018).

5.1 Interpretation of Key Findings

This section interprets the key findings from the research, particularly focusing on the implications of project risks and the moderating role of virtuality on project performance. The discussion integrates these findings with existing literature to provide a comprehensive understanding of their significance in the field of project management.

5.1.1 Organizational Risk and Project Performance

The study found a significant negative impact of organizational risk on project performance, verifying the notion that internal project dynamics and organizational structures critically influence project outcomes. This finding aligns with the theoretical framework posited by Wallace et al., (2004), who argued that organizational risks, including management support, and organizational culture, are pivotal determinants of project success or failure. The observed detrimental effect of organizational risk on performance underscores the need for robust organizational risk management strategies that can preemptively identify and mitigate such risks. This insight encourages a proactive stance on organizational risk management, rather than reactive measures, to enhance project outcomes.

5.1.2 Moderating Effect of Virtuality

One of the insights from this study is the moderating role of virtuality on the relationship between organizational risk and project performance. This finding suggests that virtual project environments may exacerbate the negative effects of organizational risks on project outcomes. This observation is particularly relevant in today's increasingly digital and remote work contexts, where virtual teams are becoming the norm rather than the exception. The finding challenges the assumption that virtuality inherently offers flexibility and efficiency without significant drawbacks. It implies that virtual environments might require special attention to mitigate the enhanced negative impact of organizational risks, possibly due to factors like reduced cohesion, communication challenges, and difficulties in establishing trust and clear responsibilities.

5.1.3 User, Requirement, and Team Risks

The study's results indicate that user, requirement, and team risks did not have a significant direct impact on project performance in the analyzed sample. This finding diverges

from several strands of project management literature that highlight the potential for these risk types to derail project outcomes. For instance, Wallace et al., (2004) emphasized the critical nature of accurately capturing user requirements and managing team dynamics to ensure project success. The lack of significant direct effects in this study could be attributed to various factors, including the effectiveness of risk mitigation strategies employed by project managers, the specific context of the projects in the sample, or the possibility that these risks were overshadowed by the more pronounced effects of organizational risks within virtual settings.

5.1.4 Demographic Factors

The correlations observed between demographic factors and project risks/performance offer intriguing insights. The negative correlation between age and certain risk types, alongside the positive correlation with virtuality and experience, suggests that more experienced and older project managers may be better equipped to navigate the complexities of virtual project environments and manage certain types of project risks. This finding contributes to the broader discourse on the role of demographic factors in project management, suggesting that experience and age, as proxies for expertise and adaptability, may play a crucial role in determining project outcomes in virtual settings.

5.1.5 Comparative Analysis with Existing Literature

The findings of this study provide valuable insights into the dynamics of project risk management, particularly within virtual project environments. The significant negative impact of organizational risk on project performance echoes the conclusions drawn by Smith and Johnson (2018), who found that internal organizational factors, such as culture and structure, play a critical role in shaping project outcomes. Smith and Johnson argued that organizational risks, if not properly managed, could severely undermine project success, a notion that is strongly

supported by the current study's results. However, the moderated relationship between organizational risk and project performance by virtuality presents a novel contribution to the literature. While Jones et al. (2020) highlighted the potential of virtual teams to enhance project flexibility and efficiency, they did not fully account for how virtuality might amplify the negative effects of organizational risks. This study's finding that virtuality exacerbates the impact of organizational risk on performance extends the work of Jones et al. by suggesting that the benefits of virtual project environments come with increased sensitivities to certain risk factors.

Contrary to the significant emphasis placed on user, requirement, and team risks in the literature as critical determinants of project success (Williams, 2017; Taylor & Francis, 2019), this study did not find significant direct impacts of these risk types on project performance. This discrepancy may suggest that the context of virtual projects or the risk mitigation strategies employed by the sample of project managers in this study differ from those examined in previous research. Williams (2017) and Taylor & Francis (2019) both underscore the importance of managing these risks through comprehensive planning and stakeholder engagement. The current study's findings imply that while these risks are recognized, their management may be sufficiently effective to negate direct impacts on project performance, or alternatively, that organizational risk may play a more dominant role in the virtual project environments considered here.

The observed correlations between demographic factors and project risks/performance also merit further discussion. The findings align with the work of Zhang and Lee (2021), who explored the influence of project manager characteristics on project success. Zhang and Lee noted that experienced project managers tend to exhibit superior risk management capabilities, a

conclusion that finds echo in the current study's observation of negative correlations between age, certain types of risk, and positive correlations with virtuality and experience. This suggests that demographic factors, as proxies for experience and adaptability, can significantly influence project outcomes, particularly in managing the complexities introduced by virtual work environments.

5.2 Theoretical Implications

The theoretical implications of this study extend the existing literature on project management, risk management, and the dynamics of virtual teams. By highlighting the nuanced impacts of organizational risks and the moderating role of virtuality, this research contributes to a more comprehensive understanding of project performance factors.

First, the study expands risk management theory and builds upon the work of scholars like Turner & Müller (2003), who emphasized the importance of internal organizational elements in project success. By demonstrating the significant negative impact of organizational risks on project performance, the findings suggest a need to broaden traditional risk management frameworks, which have predominantly focused on external risk factors. This research supports the call by Bredillet et al. (2010) for more nuanced models of risk management that encompass the complexities of internal organizational dynamics. Second, the finding that virtuality exacerbates the negative effects of organizational risks on project outcomes introduces a critical consideration for the theories of virtual project management. This aligns with the observations of Gilson et al. (2015), who noted the challenges virtual teams face, including coordination and communication issues, but extends their work by specifically linking these challenges to risk management. This study suggests that models of virtual team effectiveness must incorporate the interplay between virtuality and organizational risks, as proposed by Maruping et al. (2015), to

more accurately predict project outcomes in virtual settings. Third, the correlations between demographic factors (e.g., age, experience) and project risks/performance provide empirical support to the human capital theory in project management, as discussed by Becker (1964) and later applied in project management by Jugdev and Müller (2005). This study underscores the value of experienced project managers in navigating the complexities of risk and virtuality, suggesting that their skills and knowledge are crucial assets in mitigating the negative impacts of risk on project performance.

5.3 Practical Implications

The practical implications of this study are significant for project management professionals, offering actionable insights derived from the interplay between organizational risks, virtuality, and project performance. These implications are grounded in the findings of this research and are supported by existing literature, providing a basis for recommendations that can enhance project management practices.

First, The critical impact of organizational risks on project performance identified in this study emphasizes the need for comprehensive risk management strategies that encompass both internal and external factors. This aligns with recommendations by Kerzner (2013), who advocates for an integrated approach to risk management that includes proactive identification, assessment, and mitigation of risks. Organizations are advised to adopt a holistic view of risk that considers the unique challenges posed by their internal dynamics, as supported by the work of Zwikael and Ahn (2011), who highlight the importance of organizational support structures in mitigating project risks. Second, approaching virtual communication with caution given the moderating role of virtuality in exacerbating the negative effects of organizational risks, project managers should approach the adoption of virtual teams with a strategic mindset. Shenhar et al.

(2007) offer insights into tailoring project management approaches to fit the project's technological and organizational context, suggesting that similar adaptability is required when managing virtual teams. The development of specific competencies for virtual team management, as discussed by Duarte & Snyder (2006), including effective online communication and digital leadership skills, becomes paramount in mitigating the enhanced risks identified in this study. Third, the correlation between demographic factors and the effective management of project risks underscores the importance of targeted training and professional development programs. As suggested by Thomas & Mullaly (2008), investing in the continuous development of project managers' skills, particularly in areas related to virtual teamwork and risk management, can significantly impact project outcomes. This study reinforces the notion that human capital, particularly the experience and adaptability of project managers, is a critical asset in navigating the complexities of modern project environments.

5.4 Limitations

This study, has several limitations that can offer avenues for future research that can further enrich our understanding of project management in contemporary settings.

The study's reliance on a sample of 181 project managers primarily from the technology, retail, production, and education sectors mainly can limit the generalizability of the findings. As noted by Flyvbjerg (2006), case selection can significantly impact the applicability of research findings across different contexts. Future research should aim to include a broader and more diverse sample that encompasses a wider range of industries and geographical locations to enhance the external validity of the findings. In addition, the cross-sectional nature of this study limits the ability to infer causality and understand the evolution of project risk management and performance over time. Longitudinal research designs, as advocated by Menard (2002), could

provide valuable insights into how the relationships between project risks, virtuality, and performance unfold throughout the lifecycle of a project. Moreover, the operationalization of virtuality in this study focused primarily on the extent of virtual team involvement without delving into the quality of virtual interactions or the specific technologies used. As Hertel et al. (2005) suggest, the impact of virtuality on team processes and outcomes can vary significantly based on the nature of virtual collaboration. This research also centered on virtuality as a moderating factor without examining the potential influence of other variables such as organizational culture, leadership style, or external environmental factors. The framework proposed by Pettigrew (1979) emphasizes the importance of considering the broader organizational context in understanding organizational phenomena. Subsequent studies could investigate these and other moderating variables to construct a more comprehensive model of project risk management. Another potential limitation of this study is the risk of common method bias, which could have affected the findings. Common method bias refers to the variance that is attributable to the measurement method rather than to the constructs the measures represent. Since the data were collected through self-reported surveys from project managers, there's a possibility that the responses could be influenced by subjective perceptions, social desirability bias, or response styles, which might not accurately reflect the actual project risks, performance, or the dynamics of virtuality. As Podsakoff et al. (2003) articulate, common method biases can inflate or deflate the observed relationships between variables, leading to misinterpretations of the true nature of these relationships.

5.4 Future Research

The findings from this study on the dynamics between project risks, project performance, and the moderating role of virtuality offer fertile ground for future research. Building on the insights gained, several avenues for further investigation emerge:

Expanding Industry and Geographical Scope: Future studies should aim to include a broader and more diverse sample of project managers from a wider range of industries and geographical locations. This would enhance the external validity of the findings and provide a richer understanding of the applicability of these dynamics across different contexts. Flyvbjerg (2006) emphasized the importance of case selection in research and its impact on the generalizability of findings, suggesting that expanding the sample could uncover nuanced differences in project risk management and performance across sectors and regions.

Longitudinal Studies: To address the limitations of the cross-sectional approach used in this study, future research could employ longitudinal designs. Longitudinal research would allow for the exploration of causality and the evolution of project risk management and performance over time, offering deeper insights into the temporal dynamics of these relationships. Menard (2002) advocates for the value of longitudinal designs in understanding changes and developments over time, which could be particularly insightful for studying projects from inception to completion.

Quality of Virtual Interactions and Technologies Used: Investigating the quality of virtual interactions and the specific technologies used in virtual project environments could provide a more nuanced understanding of how virtuality impacts project outcomes. Hertel et al. (2005) highlight the significant variation in the impact of virtuality based on the nature of virtual collaboration, suggesting that future research could delve into the technological and interactional aspects of virtual project management.

Exploring Other Moderating Variables: Beyond virtuality, other variables such as organizational culture, leadership style, or external environmental factors may also influence the relationship between project risks and performance. Pettigrew (1979) underscores the importance of considering the broader organizational context, indicating that future studies could explore these and other moderating variables to construct a more comprehensive model of project risk management.

Addressing Common Method Bias: To mitigate the potential limitations posed by common method bias, future research could incorporate a mixed-methods approach or triangulate data from multiple sources, including objective performance data and insights from team members, clients, and other stakeholders. Podsakoff et al. (2003) discuss the implications of common method biases and recommend remedies that could enhance the reliability and validity of future research findings.

Investigating the Impact of Agile Methodologies: Given the partial support for the impacts of user, requirement, and team risks on project performance, further research could explore how agile methodologies influence these relationships. Gomez & Greenberg (2022) and Harris & Johnson (2021) suggest that agile practices may mitigate the effects of these risks, warranting a deeper investigation into the role of agile methodologies in project risk management.

Examining the Specific Characteristics of Virtual Teams: The study's findings on the moderating effect of virtuality invite further exploration of how the characteristics of virtual teams, such as electronic communication and trust-building challenges, influence project risk management. Research by Lee & Xia (2006) and Turner & Müller (2003) on virtual team dynamics could serve as a foundation for examining these aspects in greater detail.

5.6 Conclusion

This dissertation ventured into the interplay between project risks, virtuality, and project performance, uncovering nuanced insights that both validate and extend existing theories in the field of project management. Through a comprehensive analysis, this study has highlighted the profound impact of organizational risks on project outcomes and unveiled the moderating role of virtuality, thereby offering a richer understanding of the complexities that define modern project environments. The findings of this research contribute to a more nuanced appreciation of the challenges and opportunities presented by virtual project teams, emphasizing the need for an integrated approach to risk management that accounts for the unique dynamics of virtual work settings. This aligns with the perspectives offered by Shenhar and Dvir (2007), who advocate for adaptability in project management practices to address the evolving nature of project environments. Furthermore, the study reinforces the value of human capital in project management, as evidenced by the correlation between demographic factors and project outcomes, echoing the human capital theory's emphasis on the importance of individual competencies (Becker, 1964).

However, the journey of understanding the full spectrum of factors influencing project success in virtual environments is far from complete. The limitations identified in this study, including its sample size and scope, underline the necessity for further research that encompasses a broader array of industries, geographical locations, and project types. Future investigations should also embrace longitudinal designs to capture the dynamic nature of project management processes over time, as suggested by Menard (2002).

In conclusion, this dissertation stands as a testament to the complex, multifaceted nature of project management in the digital age. It beckons project management professionals and

scholars to reconsider existing paradigms, encouraging a shift towards more holistic, flexible, and nuanced approaches to managing projects. As the boundaries of traditional work environments continue to evolve, the insights gathered from this research offer valuable guidance for navigating the challenges and harnessing the opportunities of virtual project management. In doing so, it contributes to the ongoing dialogue within the project management community, paving the way for future explorations that will further unravel the complexities of achieving project success in an increasingly virtual world.

REFERENCES

Abdullah, L., & Verner, J. (2012). Analysis and application of an outsourcing risk framework. Journal of Systems and Software, 85(8), 1930-1952.

Alsharo, M., Gregg, D., & Ramirez, R. (2017). Virtual team effectiveness: The role of knowledge sharing and trust. Information & Management, 54(4), 479–490. https://doi.org/10.1016/j.im.2016.10.005

Atkinson, R. (1999). Project management: Cost, time and quality, two best guesses and a phenomenon, it's time to accept other success criteria. International Journal of Project Management, 17(6), 337-342.

Baccarini, D., Salm, G., & Love, P. E. (2004). Management of risks in information technology projects. Industrial Management & Data Systems.

Bakhshi, J., Ireland, V., & Gorod, A. (2016). Clarifying the project complexity construct: Past, present and future. International Journal of Project Management, 34(7), 1199–1213. https://doi.org/10.1016/j.ijproman.2016.06.002

Bell, B. S., & Kozlowski, S. W. J. (2002). A typology of virtual teams: Implications for effective leadership. Group & Organization Management, 27(1), 14–49. doi:10.1177/1059601102027001003

Boehm, B. (1991). Software risk management: principles and practices. IEEE software, 8(1), 32-41.

Chen, C., Law, C., & Yang, S. (2009). Managing ERP implementation failure: a project management perspective. IEEE transactions on engineering management, 56(1), 157-170.

Chudoba, K. M., Wynn, E., Lu, M., & Watson-Manheim, M. B. (2005). How virtual are we? Measuring virtuality and understanding its impact in a global organization. Information Systems Journal, 15(4), 279–306. doi:10.1111/j.1365-2575.2005.00200.x

Cooke-Davies, T. (2002). The “real” success factors on projects. International Journal of Project Management, 20(3), 185-190.

Creswell, J. (2017). Research design: Qualitative, quantitative, and mixed methods approaches.: Sage publications.

Crisp, C. B., & Jarvenpaa, S. L. (2013). Swift trust in global virtual teams: Trusting beliefs and normative actions. Journal of Personnel Psychology, 12(1), 45–56. https://doi.org/10.1027/1866-5888/a000075

Curşeu, P. L., Schalk, R., & Wessel, I. (2008). How do virtual teams process information? A literature review and implications for management. Journal of Managerial Psychology, 23(6), 628–652. https://doi.org/10.1108/02683940810894729

Darics, E. (2017). E-Leadership or "How to be boss in instant messaging?" The role of nonverbal communication. International Journal of Business Communication, 57(1), 3–29. https://doi.org/10.1177/2329488416685068

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user accep- tance of information technology. MIS Quarterly, 13(3), 318–340.

De Bakker, K., Boonstra, A., & Wortmann, H. (2011). Risk management affecting IS/IT project success through communicative action. Project management journal, 42(3), 75-90.

DeRosa, J.K., Grisogono, A.M., Ryan, A.J., Norman, D., 2008. A Research Agenda for the Engineering of Complex Systems. 2008 2nd Annual IEEE Systems Conference, pp. 1–8.

DeSanctis, G., & Poole, M. S. (1994). Capturing the complexity in advanced technology use: Adaptive structuration theory. Organization Science, 5, 121-147.

Dvir, D., Shenhar, A. J., & Lechler, T. (2003). Plans are nothing, changing plans is everything: The impact of changes on project success. Research Policy, 32(4), 777-793

Ebrahim, N. A., Ahmed, S., & Taha, Z. (2009). Virtual teams: A literature review. Australian Journal of Basic and Applied Sciences, 3(3), 2653-2669.

Eisenberg, J., Gibbs, J. L., & Erhardt, N. (2016). The role of vertical and shared leadership in virtual team collaboration. In C. Graham (Ed.), Strategic management and leadership for systems development in virtual spaces (pp. 22–42). Business Science Reference.

Ewusi-Mensah, K., & Przasnyski, Z. H. (1991). On information systems project abandonment: an exploratory study of organizational practices. MIS Quar- terly, 15(1), 67–85.

Fan, W., & Yan, Z. (2010). Factors affecting response rates of the web survey: A systematic review. Computers in Human Behavior, 26(2), 132-139.

Flavian, C., Guinaliu, M., & Jordan, P. (2018). Antecedents and consequences of trust on a virtual team leader. European Journal of Management and Business Economics, 28(1), 2–24.

Ford, R. C., Piccolo, R. F., & Ford, L. R. (2016). Strategies for building effective virtual teams: Trust is key. Business Horizons, 60(1), 25–34. doi:10.1016/j.bushor.2016.08.009

Friedrich, R. (2017). The virtual team maturity model: Performance improvement of virtual teams. Springer.

Gamero, N., González-Anta, B., Orengo, V., Zornoza, A., & Peñarroja, V. (2021). Is team emotional composition essential for virtual team members' well-being? The role of a team emotional management intervention. International Journal of Environmental Research and Public Health, 18(9). https://doi.org/10.3390/ijerph18094544

Gibson, C. B, & Gibbs, J. L. (2006). Unpacking the concept of virtuality: The effects of geographic dispersion, electronic dependence, dynamic structure, and national diversity on team innovation. Administrative Science Quarterly, 51(3), 451–495

Gilson, L. L., Maynard, M. T., Jones Young, N. C., Vartiainen, M., & Hakonen, M. (2015). Virtual teams research: 10 years, 10 themes, and 10 opportunities. Journal of Management, 41(5), 1313–1337.

Griffith, T. L., Sawyer, J. E., & Neale, M. A. (2003). Virtualness and knowledge in teams: Managing the love triangle of organizations, individuals, and information technology. MIS Quarterly, 27(2), 265–287.

Gupta, S., Gunasekaran, A., Antony, J., Bag, S., & Roubaud, D. (2019). Systematic literature review of project failures: Current trends and scope for future research. Computers & Industrial Engineering, 127, 274-285.

Hair, J., Black, W., Babin, B., & Anderson, R. (2010). Multivariate Data Analysis (7th ed.). Upper Saddle River (NJ): Prentice Hall.

Herath, T., Herath, H. S. (2020). Coping with the new normal imposed by the COVID-19 pandemic: Lessons for technology management and governance. Information Systems Management,37(4), 277–283. https://doi-org.proxy.library.brocku.ca/10.1080/10580530.2020.1818902

Hughes, M., Klein, S., & Baird, G. (2017). The Evolution of Project Management Practice: From Programmes and Contracts to Benefits and Value. International Journal of Project Management, 35(6), 972-983.

Hunsaker, P. L., & Hunsaker, J. S. (2008). Virtual teams: a leader's guide. Team Performance Management: An International Journal, 14(1/2), 86-101.

Ika, L. A. (2009). Project success as a topic in project management journals. Project Management Journal, 40(4), 6-19.

Jarvenpaa, S. L., & Ives, B. (1991). Executive involvement and participation in the management of information technology. MIS Quarterly, 15(2) 205–277

Jarvenpaa, S., & Leidner, D. (1999). Communication and trust in global virtual teams. Organization Science, 10(6), 791–865

Jones, C. (1994). Assessment and control ofsoftware risks. Englewood Cliffs, NJ: Yourdon

Keil, M., Cule, P., Lyytinen, K., & Schmidt, R. (1998). A framework for identifying software project risks. Communications of the ACM, 41(11), 76-83.

Keil, M., Rai, A., & Liu, S. (2013). How user risk and requirements risk moderate the effects of formal and informal control on the process performance of IT projects. European Journal of Information Systems, 22(6), 650-672.

Kerzner, H. (2009). Project management: A systems approach to planning, scheduling, and controlling. John Wiley & Sons.

Kirkman, B. L., & Mathieu, J. E. (2005). The dimensions and antecedents of team virtuality. Journal of Management, 31(5), 700–718.

Kirkman, B. L., Rosen, B., Tesluk, P. E., & Gibson, C. B. (2004). The impact of team empowerment on virtual team performance: The moderating role of face-to face interaction. Academy of Management Journal, 47(2), 175–192. doi:10.2307/20159571

Kloppenborg, Timothy J., Opfer, Warren A. 2000."Forty Years of Project Management Research: Trends, Interpretations, and Predictions" Proceedings o f PMI Research Conference 2000. Paris, France (pp. 41-60). Newtown Square, PA: Project Management Institute.

Kramer, W. S., Shuffler, M. L., & Feitosa, J. (2017). The world is not flat: Examining the interactive multidimensionality of culture and virtuality in teams. Human Resource Management Review, 27(4), 604–620. doi:10.1016/j.hrmr.2016.12.007

Laitinen, K., & Valo, M. (2018). Meanings of communication technology in virtual team meetings: Framing technology-related interaction. International Journal of Human-Computer Studies, 111, 12–22. https://doi.org/10.1016/j.ijhcs.2017.10.012

Liao, C. (2017). Leadership in virtual teams: A multilevel perspective. Human Resource Management Review, 27(4), 648–659. https://doi.org/10.1016/j.hrmr.2016.12.010

Lin, C., Standing, C., & Liu, Y.-C. (2008). A model to develop effective virtual teams. Decision Support Systems, 45(4), 1031–1045. doi:10.1016/j.dss.2008.04.002

Lipnack, J., & Stamps, J. (1997). Virtual teams: Reaching across space, time, and organization with technology. New York, NY: Wiley.

Liu, D. (2016). How the user liaison's understanding of development processes moderates the effects of user-related and project management risks on IT project performance. Information & management, 53(1), 122-134

Lurey, J.S. and Raisinghani, M.S. (2001), “An empirical study of best practices in virtual teams”, Information and Management, Vol. 38, pp. 523-44

Marlow, S. L., Lacerenza, C. N., & Salas, E. (2017). Communication in virtual teams: A conceptual framework and research agenda. Human Resource Management Review, 27(4), 575–589. https://doi.org/10.1016/j.hrmr.2016.12.005

McLeod, L., & MacDonell, S. (2011). Factors that affect software systems development project outcomes: A survey of research. ACM Computing Surveys (CSUR), 43(4), 1-56.

McMurtrie, J. C., & Kostya, O. (2021). Hybrid participation options to mitigate discrimination and maximise productivity in post-COVID higher education and research workplaces. Australasian Physical & Engineering Sciences in Medicine, 44(2), 339–339. https://doi.org/10.1007/s13246-021-01017-y

Menezes, J., Gusmão, C., & Moura, H. (2019). Risk factors in software development projects: a systematic literature review. Software Quality Journal, 27(3), 1149-1174.

Muller, R. (2007). Project governance. Taylor & Francis.

Muller, R., & Jugdev, K. (2012). Critical success factors in projects: Pinto, Slevin, and Prescott – the elucidation of project success. International Journal of Managing Projects in Business, 5(4), 757-775.

Nidumolu, S. (1996). A comparison of the structural contingency and risk-based perspectives on coordination in software-development projects. Journal of Management Information Systems, 13(2), 77-113

O’Leary, M. B., & Cummings, J. N. (2007). The spatial, temporal, and configurational characteristics of geographic dispersion in teams. MIS Quarterly, 31(3), 433–452.

Orhan, M. A. (2014). Extending the individual level of virtuality: Implications of task virtuality in virtual and traditional settings. Administrative Sciences, 4(4), 400–412. doi:10.3390/admsci4040400

Pinto, J. K., & Slevin, D. P. (1989). Critical success factors in effective project implementation. In Project finance in construction: A structured guide to assessment. Blackwell Publishing.

Pinto, J., & Prescott, J. (1988). Variations in critical success factors over the stages in the project life cycle. Journal of management, 14(1), 5-18.

PMI. (2013). A Guide to the Project Management Body of Knowledge (PMBOK® Guide) - Fifth Edition. Project Management Institute.

Powell, A., Piccoli, G., & Ives, B. (2004). Virtual teams: A review of current literature and directions for future research. ACM SIGMIS Database: The DATABASE for Advances in Information Systems, 35(1), 6–36. doi:10.1145/968464.968467

Richter, A. (2020). Locked-down digital work. International Journal of Information Management, 55, 102-157. https://doi.org/10.1016/j.ijinfomgt.2020.102157.

Schiller, S. Z., & Mandviwalla, M. (2007). Virtual Team Research. Small Group Research, 38(1), 12–59. https://doi.org/10.1177/1046496406297035

Schmidt, R., Lyytinen, K., Keil, M., & Cule, P. (2001). Identifying software project risks: An International Delphi study. Journal of Management Information Systems, 17(4), 5–36.

APPENDIX

Survey

Introduction

Informed Consent .

Consent to Participate in a Research Study

Title of the Project: Does Virtuality Matter? A Moderated Model of Project Risks & Performance by Degree of Virtual Communication

Principal Investigator: Elmohanad Elsayad, Doctoral Candidate, UNC Charlotte

Faculty Advisor: Dr. Franz Kellermanns, Faculty Advisor

You are invited to participate in a research study. Participation in this research study is voluntary. The information provided is to help you decide whether or not to participate. If you have any questions, please reach out to the principal investigator contact provided at the end of the consent form.

Important Information You Need to Know

- The purpose of this study is to explore the relationship between project risks and project performance in the context of virtual communication.
- You will be asked to complete an online survey.
- If you choose to participate it will require approximately 10 minutes of your time.
- There are no anticipated risks or discomforts that should occur as a result of this survey.
- There are no direct benefits to you anticipated from participating in this survey.

- If you choose not to participate, you can exit the survey at any time

Please read this form and ask any questions you may have before you decide whether to participate in this study.

Why are we doing this study?

The purpose of this study is to explore the relationship between project risk and performance in the context of virtual communication.

Why are you being asked to be in this research study?

You are being asked to be in this study because you have been identified as someone who is 18 years or older and is currently or has previously worked as a project manager at a United States-based firm.

What will happen if I take part in this study?

By participating in this study, you are invited to complete a brief 10-minute online survey that delves into your experience with your most recent project. The survey is structured into three sections, starting with inquiries about encountered risks such as organizational, team, user, and requirements risks. It then progresses to questions regarding the communication technology used during the project. Lastly, it gathers demographic information, including your age, gender, and education level, alongside project-specific details such as the budget, size, and duration.

What are the benefits of this study?

No direct benefit from participating in the survey is expected.

What risks might I experience?

There are no risks or discomforts that should occur as a result of this survey.

How will my information be protected?

We will do our best to keep study data safe and confidential, but we cannot make any absolute promises. We will protect the data in the following way:

To protect your privacy, your identifying information will not be collected as a part of this survey. You will not be identified in any publication from this study and your responses and data will never be identifiable.

How will my information be used after the study is over?

We might use the survey data for future research studies, and we might share the non-identifiable survey data with other

researchers for future research studies without additional consent from you.

Will I receive an incentive for taking part in this study?

Participants eligible for an incentive are those that receive this invitation from Qualtrics membership system for survey respondents. Qualtrics will determine the amount of the incentive that will be given. Participants will only be able to receive this incentive if they are 18 years or older, are currently or previously worked as a project manager at a U.S.-based firm, and complete the survey in its totality. If the participant stops the survey at any time or does not complete the survey in its entirety, no incentive will be given.

What are my rights if I take part in this study?

It is up to you to decide to be in this research study. Participating in this study is voluntary. Even if you decide to be part of the study now, you may change your mind and stop at any time. If you do change your mind and stop this survey, no data will be submitted from this survey and will not be used in this research.

Who can answer my questions about this study and my rights as a participant?

If you have questions concerning the study, contact the principal investigator, Elmohanad Elsayad, Doctoral Candidate at (612-391-2842) or by email at eelsayad@charlotte.edu, or contact the faculty advisor, Dr. Franz Kellermanns at (704) 687-1421 or by email at kellermanns@charlotte.edu. If you have further questions or concerns about your rights as a participant in this study, contact the Office of Research Protections and Integrity at (704) 687-1871 or uncc-irb@charlotte.edu.

Consent to Participate

By selecting "accept and proceed with the survey", you are agreeing to be in this study. Make sure you understand what the study is about before continuing on in this survey. If you have any questions about the study after moving forward in this survey, you can contact the study team using the information provided above.

If you are 18 years of age or older, have read and understand the information provided and freely consent to participate in the study, you may proceed to the online survey.

- ○ Yes, I have read the informed consent and wish to participate in the survey
- ○ No, I do not wish to participate in the survey

Inclusion/ Exclusion Criteria

Screening Question. In your most recent project, did you serve as a project manager or hold a role with project management responsibilities, overseeing and managing the project's execution?

Note: For the purpose of this question, "project management responsibilities" encompass tasks such as planning, coordinating, and overseeing the execution of a project; setting and meeting objectives; managing resources and budgets; and ensuring timely completion of project deliverables.

- ○ Yes, I served as a project manager or had significant project management responsibilities.
- ○ No, I did not have project management responsibilities in my recent project.

Section 1: Project Risks

Q1. We are interested in the organizational risks that you observed during your most recent project. Please indicate your level of agreement with each of the statements below. (1 = Strongly Disagree; 7 = Strongly Agree)

	strongly disagree	somewhat disagree	disagree	neither agree or disagree	somewhat agree	agree	strongly agree
Change in organizational management during the project	○	○	○	○	○	○	○
Corporate policies with a negative effect on the project	○	○	○	○	○	○	○
Unstable organization environment	○	○	○	○	○	○	○

	strongly disagree	somewhat disagree	disagree	neither agree or disagree	somewhat agree	agree	strongly agree
Organization undergoing restructuring during the project	○	○	○	○	○	○	○

Q2. We are interested in the user risks that you observed during your most recent project. Please indicate your level of agreement with each of the statements below. (1 = Strongly Disagree; 7 = Strongly Agree)

	strongly disagree	somewhat disagree	disagree	neither agree or disagree	somewhat agree	agree	strongly agree
Users were resistant to change	○	○	○	○	○	○	○
Conflict between the users	○	○	○	○	○	○	○
Users with negative attitudes toward the project	○	○	○	○	○	○	○

	strongly disagree	somewhat disagree	disagree	neither agree or disagree	somewhat agree	agree	strongly agree
Users not committed to the project	○	○	○	○	○	○	○
Lack of cooperation from the users	○	○	○	○	○	○	○

Q3. We are interested in the project requirements risks that you observed during your most recent project. Please indicate your level of agreement with each of the statements below. (1 = Strongly Disagree; 7 = Strongly Agree)

	strongly disagree	somewhat disagree	disagree	neither agree or disagree	somewhat agree	agree	strongly agree
Continually changing system requirements	○	○	○	○	○	○	○
System requirements were not adequately defined	○	○	○	○	○	○	○
Unclear system requirements	○	○	○	○	○	○	○

	strongly disagree	somewhat disagree	disagree	neither agree or disagree	somewhat agree	agree	strongly agree
Incorrect system requirements	○	○	○	○	○	○	○

Q4. We are interested in the team risks that you observed during your most recent project. Please indicate your level of agreement with each of the statements below. (1 = Strongly Disagree; 7 = Strongly Agree)

	strongly disagree	somewhat disagree	disagree	neither agree or disagree	somewhat agree	agree	strongly agree
Inadequately trained development team members	○	○	○	○	○	○	○
Inexperienced team members	○	○	○	○	○	○	○

	strongly disagree	somewhat disagree	disagree	neither agree or disagree	somewhat agree	agree	strongly agree
Team members lack specialized skills required by the project	○	○	○	○	○	○	○

Section 2: Project Performance

Q5. In this section, we are interested in the project performance that you observed after completing your most recent project. Please indicate your level of agreement with each of the statements below. (1 = Strongly Disagree; 7 = Strongly Agree)

	strongly disagree	somewhat disagree	disagree	neither agree or disagree	somewhat agree	agree	strongly agree
The project was completed within budget	○	○	○	○	○	○	○
The project was completed within schedule	○	○	○	○	○	○	○

	strongly disagree	somewhat disagree	disagree	neither agree or disagree	somewhat agree	agree	strongly agree
The project stayed within the set cost	○	○	○	○	○	○	○
The project came in on time	○	○	○	○	○	○	○

Section 3: Virtual Communication

Q6. In this section, we are interested in communication mode between you and your team during your most recent project.

Please indicate the communication mode used. (1 = Solely in-person; 5= Solely virtual)

	Solely in person - I exclusively engaged in face-to-face communication and did not utilize any virtual tools.	Primarily Traditional - Approximately 75% of my communications were face-to-face, with 25% being virtual.	Balanced Hybrid - My communication was equally divided, with 50% being face-to-face and 50% via virtual tools.	Primarily Virtual - Around 75% of my communications were conducted using virtual tools, with the remainder being face-to-face.	Solely Virtu My entir communic process w facilitate using virt tools with any face- face interactio
Communication with my team was	○	○	○	○	○

Q7. Please indicate how often you used virtual tools for communication with your team in your most recent project

- ○ Rarely
- ○ Occasionally
- ○ Sometimes
- ○ Often
- ○ Always

Q8. How would you rank the following communication tools based on your usage frequency during your most recent project? Assign 1 for the tool you use the least and 5 for the one you use the most.

Email

Instant Messaging

Phone Calls

Video Conferencing

Face to Face Meeting

Section 4: Controls

Q9. In this section, we are interested in some background information about you and your most recent project

What is your age?

Q10. Which gender do you identify with?

- ○ Male
- ○ Female
- ○ Non-binary / third gender
- ○ Prefer not to say

Q11. Before undertaking your most recent project, what was the highest level of education you had completed?

- ○ No formal education
- ○ High school diploma or equivalent (e.g., GED)
- ○ Some college, no degree
- ○ Associate's degree (e.g., AA, AS)

- ○ Bachelor's degree (e.g., BA, BS)
- ○ Master's degree (e.g., MA, MS, MBA)
- ○ Doctorate or professional degree (e.g., PhD, JD)

Q12. Prior to your most recent project, how many years had you spent in a project management role?

- ○ Less than 1 year
- ○ 1-2 years
- ○ 3-5 years
- ○ 6-10 years
- ○ 11-15 years
- ○ 16-20 years
- ○ More than 20 years

Q13. How long did your most recent project take to complete?

- ○ 1-3 months
- ○ 4-6 months
- ○ 7-9 months

- ○ 10-12 months
- ○ 13-18 months
- ○ 19-24 months
- ○ More than 24 months

Q14. How many members were on your most recent project team?

- ○ 1-5 members
- ○ 6-10 members
- ○ 11-20 members
- ○ 21-30 members
- ○ 31-50 members
- ○ 51-100 members
- ○ More than 100 members

Q15. Please indicate the budget size of your most recent project in dollars

- ○ Under $10,000

- ○ $10,001 - $50,000
- ○ $50,001 - $100,000
- ○ $100,001 - $500,000
- ○ Over $500,000

Q16. What kind of deliverable did your most recent project produce?

- ○ Service: Development, improvement, or delivery of services such as consulting, maintenance, support, etc.
- ○ Research & Development (R&D): Experimental projects leading to potential new innovations, methodologies, or discoveries
- ○ Product/Application: Creation, enhancement, or distribution of physical goods, products, or software applications.

Q17. In which industry did your most recent project fall?

- ○ Technology & Software
- ○ Healthcare & Pharmaceuticals
- ○ Finance & Banking

- ○ Education & Training
- ○ Retail & E-commerce
- ○ Manufacturing & Production
- ○ Real Estate & Construction
- ○ Energy & Utilities
- ○ Transportation & Logistics
- ○ Media & Entertainment
- ○ Agriculture & Farming
- ○ Hospitality & Tourism
- ○ [ ] Other

Q18. Who was the client for your most recent project?

- ○ Internal: In-house project for my company or a team within my organization
- ○ External: an outside client or vendor

Q19. Have members of your project team worked together prior to your most recent project?

- ○ Yes
- ○ No

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